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## **Foreword**

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

## 1 Scope

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

## 2 References

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

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.

Standalone".

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

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

[20]	3GPP TS 38.101-3: "NR; User Equipment (UE) radio transmission and reception; Part 3: Range 1 and Range 2 Interworking operation with other radios".
[21]	3GPP TS 38.101-4: "NR; User Equipment (UE) radio transmission and reception; Part 4: Performance requirements".
[22]	3GPP TS 38.305: "NG Radio Access Network (NG-RAN); Stage 2 functional specification of User Equipment (UE) positioning in NG-RAN".
[23]	3GPP TS 36.211: "Evolved Universal Terrestrial Radio Access (E-UTRA); Physical Channels and Modulation".
[24]	3GPP TS 36.300: "Evolved Universal Terrestrial Radio Access (E-UTRA); Overall description".
[25]	3GPP TS 36.101: "Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception".
[26]	3GPP TS 38.214: "NR; Physical layer procedures for data".
[27]	3GPP TS 36.355: "Evolved Universal Terrestrial Radio Access (E-UTRA); LTE Positioning Protocol (LPP)".
[28]	Void.

## 3 Definitions, symbols and abbreviations

#### 3.1 Definitions

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

**RLM-RS resource:** A resource out of the set of resources configured for RLM by higher layer parameter RLM-RS-List

[2] as defined in TS 38.213 [3].

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

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

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

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

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

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

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

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

#### **Symbols** 3.2

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

Values included in square bracket must be considered for further studies, because it means that a [...]

decision about that value was not taken.

Basic time unit, defined in clause 4.1 of TS 38.211 [6].  $T_{\rm c}$ 

Reference time unit, defined in clause 4.1 of TS 38.211 [6].  $T_s$ 

#### 3.3 **Abbreviations**

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

**BFD** Beam Failure Detection **BFD-RS** BFD Reference Signal **Block Error Rate BLER** 

Beam Management Reference Signal BM-RS

**BWP** Bandwidth Part Carrier Aggregation CA Candidate Beam Detection **CBD** CCComponent Carrier **CORESET** Control Resource Set

CP Cyclic Prefix

Channel-State Information CSI CSI-RS CSI Reference Signal **Dual Connectivity** DC

**Downlink Control Information** DCI

Downlink DL

**DMRS** Demodulation Reference Signal DRX Discontinuous Reception E-CID Enhanced Cell ID E-UTRA **Evolved UTRA** 

E-UTRAN **Evolved UTRAN EN-DC** E-UTRA-NR Dual Connectivity

**FDD** Frequency Division Duplex FR Frequency Range

HARQ Hybrid Automatic Repeat Request

HO Handover L1-RSRP Layer 1 RSRP

MAC Medium Access Control
MCG Master Cell Group
MG Measurement Gap
MGL Measurement Gap Length

MGRP Measurement Gap Repetition Period

MIB Master Information Block

MN Master Node

MR-DC Multi-Radio Dual Connectivity
NE-DC NR-E-UTRA Dual Connectivity

NGEN-DC NG-RAN E-UTRA-NR Dual Connectivity

NR New Radio

NR-DC NR-NR Dual Connectivity

OFDM Orthogonal Frequency Division Multiplexing
OFDMA Orthogonal Frequency Division Multiple Access

OTDOA Observed Time Difference Of Arrival

PBCH Physical Broadcast Channel PCC Primary Component Carrier

PCell Primary Cell

PDCCH Physical Downlink Control Channel
PDSCH Physical Downlink Shared Channel
PLMN Public Land Mobile Network

PRACH Physical RACH PSCell Primary SCell

PSS Primary Synchronization Signal pTAG Primary Timing Advance Group PUCCH Physical Uplink Control Channel PUSCH Physical Uplink Shared Channel

QCL Quasi Co-Location
RACH Random Access Channel
RAT Radio Access Technology
RLM Radio Link Monitoring
RLM-RS Reference Signal for RLM

RMSI Remaining Minimum System Information

RRC Radio Resource Control
RRM Radio Resource Management
RSSI Received Signal Strength Indicator
RSTD Reference Signal Time Difference
SA Standalone operation mode
SCC Secondary Component Carrier

SCell Secondary Cell
SCG Secondary Cell Group
SCS Subcarrier Spacing
SCS<sub>SSB</sub> SSB subcarrier spacing
SDL Supplementary Downlink
SFN System Frame Number

SFTD SFN and Frame Timing Difference

SI System Information
SIB System Information Block

SMTC SSB-based Measurement Timing configuration

SpCell Special Cell

SRS Sounding Reference Signal

SS-RSRP Synchronization Signal based Reference Signal Received Power
SS-RSRQ Synchronization Signal based Reference Signal Received Quality
SS-SINR Synchronization Signal based Signal to Noise and Interference Ratio

SSB Synchronization Signal Block

SSB RP Received (linear) average power of the resource elements that carry NR SSB signals and channels,

measured at the UE antenna connector.

SSS Secondary Synchronization Signal sTAG Secondary Timing Advance Group

SUL	Supplementary Uplink
TA	Timing Advance
TAG	Timing Advance Group

TCI Transmission Configuration Indicator

TDD Time Division Duplex
TTI Transmission Time Interval

UE User Equipment

UL Uplink

#### 3.4 Test tolerances

The requirements given in the present document make no allowance for measurement uncertainty. The test specification 38.5xx [x] defines the test tolerances.

Editor's note: intended to capture test tolerances. OTA test tolerance or margin will be captured in this clause if needed.

## 3.5 Frequency bands grouping

#### 3.5.1 Introduction

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

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

## 3.5.2 NR operating bands in FR1

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

Table 3.5.2-1: NR frequency band groups for FR1

Group	NR FDD		NR FDD NR TDD		NR SDL		
	Band group notation	Operating bands	Band group notation	Operating bands	Band group notation	Operating bands	
Α	NR_FDD_FR1_A	n1, n70, n74 <sup>4</sup>	NR_TDD_FR1_A	n34, n38, n39, n40, n50, n51	NR_SDL_FR1_A	n75, n76	
В	NR_FDD_FR1_B	n66, n74 <sup>3</sup>	NR_TDD_FR1_B	-	NR_SDL_FR1_B	-	
С	NR_FDD_FR1_C	-	NR_TDD_FR1_C	n77 <sup>1</sup> , n78, n79	NR_SDL_FR1_C	-	
D	NR_FDD_FR1_D	n28	NR_TDD_FR1_D	n77 <sup>2</sup>	NR_SDL_FR1_D	-	
Е	NR_FDD_FR1_E	n2, n5, n7	NR_TDD_FR1_E	n41	NR_SDL_FR1_E	-	
F	NR_FDD_FR1_F	-	NR_TDD_FR1_F	-	NR_SDL_FR1_F	-	
G	NR_FDD_FR1_G	n3, n8, n12, n20,	NR_TDD_FR1_G	-	NR_SDL_FR1_G	-	
		n71					
H	NR_FDD_FR1_H	n25	NR_TDD_FR1_H	-	NR_SDL_FR1_H	-	

NOTE 1: Except 3.8 GHz to 4.2 GHz.

NOTE 2: Only 3.8 GHz to 4.2 GHz.

NOTE 3: Except 1475.9 MHz to 1510.9 MHz.

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

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

#### 3.5.3 NR operating bands in FR2

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

Table 3.5.3-1: NR frequency band groups for FR2

Group	Band group notation	Operating bands
Α	NR_TDD_FR2_A	n257 <sup>1</sup> , n258 <sup>1</sup> , n261 <sup>1</sup>
В	NR_TDD_FR2_B	n257 <sup>4</sup> , n258 <sup>4</sup> , n261 <sup>4</sup>
С	NR_TDD_FR2_C	
D	NR_TDD_FR2_D	
E	NR_TDD_FR2_E	
F	NR_TDD_FR2_F	n260 <sup>4</sup>
G	NR_TDD_FR2_G	n260 <sup>1</sup>
Н	NR_TDD_FR2_H	
I	NR_TDD_FR2_I	
J	NR_TDD_FR2_J	
K	NR_TDD_FR2_K	
L	NR_TDD_FR2_L	n257 <sup>2</sup> , n258 <sup>2</sup> , n261 <sup>2</sup>
M	NR_TDD_FR2_M	
N	NR_TDD_FR2_N	
0	NR_TDD_FR2_O	
Р	NR_TDD_FR2_P	
Q	NR_TDD_FR2_Q	
R	NR_TDD_FR2_R	
S	NR_TDD_FR2_S	
Т	NR_TDD_FR2_T	n257 <sup>3</sup> , n258 <sup>3</sup> , n261 <sup>3</sup>
U	NR_TDD_FR2_U	
V	NR_TDD_FR2_V	
W	NR_TDD_FR2_W	
X	NR_TDD_FR2_X	
Υ	NR_TDD_FR2_Y	n260 <sup>3</sup>
	UE power class 1.	
NOTE 2:		
	UE power class 3.	
NOTE 4:	UE power class 4.	

## 3.6 Applicability of requirements in this specification version

In this specification,

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

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

## 3.6.1 RRC connected state requirements in DRX

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

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

Otherwise the UE shall assume that DRX is used.

## 3.6.2 Number of serving carriers

#### 3.6.2.1 Number of serving carriers for SA

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

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

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

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

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

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

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

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

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

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

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

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

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

#### 3.6.3 Applicability for intra-band FR2

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

#### 3.6.4 Applicability for FR2 UE power classes

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

#### 3.6.5 Applicability for SDL bands

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

## 3.6.6 Applicability of requirements for NGEN-DC operation

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

#### 3.6.7 Applicability of QCL

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

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

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

## 4 SA: RRC\_IDLE state mobility

Editor's note: intended to capture the RRM requirements for RRC IDLE state in stand-alone operation.

#### 4.1 Cell Selection

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

#### 4.2 Cell Re-selection

#### 4.2.1 Introduction

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

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

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

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

#### 4.2.2 Requirements

#### 4.2.2.1 UE measurement capability

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

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

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

#### 4.2.2.2 Measurement and evaluation of serving cell

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

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

otherwise M1=1.

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

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

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

Table 4.2.2.2-1: N<sub>serv</sub>

DRX cycle length [s]	Scaling Factor (N1)		N <sub>serv</sub> [number of DRX cycles]
	FR1	FR2Note1	
0.32		8	M1*N1*4
0.64	4	5	M1*N1*4
1.28	'	4	N1*2
2.56	]	3	N1*2

Note 1: Applies for UE supporting power class 2&3&4. For UE supporting power class 1, N1 = 8 for all DRX cycle length.

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

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

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

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

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

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

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

when rangeToBestCell is not configured:

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

when rangeToBestCell is configured:

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

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

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

Table 4.2.2.3-1: T<sub>detect,NR\_Intra</sub>, T<sub>measure,NR\_Intra</sub> and T<sub>evaluate,NR\_Intra</sub>

DRX cycle	Scaling Factor (N1)		T <sub>detect,NR_Intra</sub> [s] (number of DRX	T <sub>measure,NR_Intra</sub> [S]	Tevaluate,NR_Intra
length [s]	FR1	FR2 <sup>Note1</sup>	cycles)	(number of DRX cycles)	[s] (number of DRX cycles)
0.32		8	11.52 x N1 x M2 (36 x	1.28 x N1 x M2 (4 x N1	5.12 x N1 x M2 (16 x
			N1 x M2)	x M2)	N1 x M2)
0.64	1	5	17.92 x N1 (28 x N1)	1.28 x N1 (2 x N1)	5.12 x N1 (8 x N1)
1.28		4	32 x N1 (25 x N1)	1.28 x N1 (1 x N1)	6.4 x N1 (5 x N1)
2.56		3	58.88 x N1 (23 x N1)	2.56 x N1 (1 x N1)	7.68 x N1 (3 x N1)

Note 1: Applies for UE supporting power class 2&3&4. For UE supporting power class 1, N1 = 8 for all DRX cycle length.
 Note 2: M2 = 1.5 if SMTC periodicity of measured intra-frequency cell > 20 ms; otherwise M2=1.

## 4.2.2.4 Measurements of inter-frequency NR cells

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

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

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

The UE shall be able to evaluate whether a newly detectable inter-frequency cell meets the reselection criteria defined in TS38.304 within  $K_{carrier}$  \*  $T_{detect,NR\_Inter}$  if at least carrier frequency information is provided for inter-frequency neighbour cells by the serving cells when  $T_{reselection} = 0$  provided that the reselection criteria is met by a margin of at least 5 dB in FR1 or 6.5 dB in FR2 for reselections based on ranking or 6 dB in FR1 or 7.5 dB in FR2 for SS-RSRP reselections based on absolute priorities or 4 dB in FR1 and 4 dB in FR2 for SS-RSRQ reselections based on absolute priorities. The parameter  $K_{carrier}$  is the number of NR inter-frequency carriers indicated by the serving cell. An inter-frequency cell is considered to be detectable according to the conditions defined in Annex B.1.3 for a corresponding Band.

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

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

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

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

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

- the condition when performing equal priority reselection and

when rangeToBestCell is not configured:

- the cell is at least 5dB better ranked in FR1 or 6.5dB better ranked in FR2 or.

when rangeToBestCell is configured:

- the cell has the highest number of beams above the threshold *absThreshSS-BlocksConsolidation* among all detected cells whose cell-ranking criterion R value [1] is within *rangeToBestCell* of the cell-ranking criterion R value of the highest ranked cell.
  - if there are multiple such cells, the cell has the highest rank among them
  - -- the cell is at least 5dB better ranked in FR1 or [6.5]dB better ranked in FR2 if the current serving cell is among them. or
- 6dB in FR1 or 7.5dB in FR2 for SS-RSRP reselections based on absolute priorities or
- 4dB in FR1 or 4dB in FR2 for SS-RSRQ reselections based on absolute priorities.

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

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

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

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

DRX cycle	Scaling F	· · ·		• • • • • • • • • • • • • • • • • • • •		Tmeasure,NR_Inter [S]	Tevaluate,NR_Inter [S]
length [s]	FR1	FR2Note1	(number of DRX cycles)	(number of DRX cycles)	(number of DRX cycles)		
0.32		8	11.52 x N1 x 1.5 (36 x	1.28 x N1 x 1.5 (4 x N1	5.12 x N1 x 1.5 (16 x		
			N1 x 1.5)	x 1.5)	N1 x 1.5)		
0.64	1	5	17.92x N1 (28 x N1)	1.28 x N1 (2 x N1)	5.12 x N1 (8 x N1)		
1.28		4	32 x N1 (25 x N1)	1.28 x N1 (1 x N1)	6.4 x N1 (5 x N1)		
2.56		3	58.88 x N1 (23 x N1)	2.56 x N1 (1 x N1)	7.68 x N1 (3 x N1)		
Note 1: An	nlies for LIF	supporting no	ower class 2&3&4 For LIF	supporting power class 1 N	11 = 8 for all DRX cycle		

Table 4.2.2.4-1: T<sub>detect,NR\_Inter</sub>, T<sub>measure,NR\_Inter</sub> and T<sub>evaluate,NR\_Inter</sub>

## length.

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

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

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

The requirements in this clause apply for inter-RAT E-UTRAN FDD measurements and E-UTRA TDD measurements. When the measurement rules indicate that inter-RAT E-UTRAN cells are to be measured, the UE shall measure RSRP and RSRQ of detected E-UTRA cells in the neighbour frequency list at the minimum measurement rate specified in this clause. The parameter  $N_{EUTRA\_carrier}$  is the total number of configured E-UTRA carriers in the neighbour frequency list. The UE shall filter RSRP and RSRQ measurements of each measured E-UTRA cell using at least 2 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least  $T_{measure,EUTRAN}/2$ .

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

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

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

Cells which have been detected shall be measured at least every ( $N_{EUTRA\_carrier}$ ) \*  $T_{measure,EUTRAN}$  when  $Srxlev \leq S_{nonIntraSearchP}$  or  $Squal \leq S_{nonIntraSearchQ}$ .

When higher priority cells are found by the higher priority search, they shall be measured at least every T<sub>measure,EUTRAN</sub>. If, after detecting a cell in a higher priority search, it is determined that reselection has not occurred then the UE is not required to continuously measure the detected cell to evaluate the ongoing possibility of reselection. However, the

minimum measurement filtering requirements specified later in this clause shall still be met by the UE before it makes any determination that it may stop measuring the cell.

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

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

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

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

DRX cycle length [s]	T <sub>detect,EUTRAN</sub> [s] (number of DRX cycles)	Tmeasure,EUTRAN [S] (number of DRX cycles)	T <sub>evaluate,EUTRAN</sub> [s] (number of DRX cycles)
0.32	11.52 (36)	1.28 (4)	5.12 (16)
0.64	17.92 (28)	1.28 (2)	5.12 (8)
1.28	32(25)	1.28 (1)	6.4 (5)
2.56	58.88 (23)	2.56 (1)	7.68 (3)

Table 4.2.2.5-1: T<sub>detect,EUTRAN</sub>, T<sub>measure,EUTRAN</sub>, and T<sub>evaluate,EUTRAN</sub>

#### 4.2.2.6 Maximum interruption in paging reception

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

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

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

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

T<sub>SI-EUTRA</sub> is the time required for receiving all the relevant system information data according to the reception procedure and the RRC procedure delay of system information blocks defined in TS 36.331 [16] for an E-UTRAN cell.

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

#### 4.2.2.7 General requirements

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

## 5 SA: RRC\_INACTIVE state mobility

#### 5.1 Cell Re-selection

#### 5.1.1 Introduction

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

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

#### 5.1.2 Requirements

#### 5.1.2.1 UE measurement capability

The requirements in sub-clause 4.2.2.1 shall apply.

#### 5.1.2.2 Measurement and evaluation of serving cell

The requirements in sub-clause 4.2.2.2 shall apply.

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

The requirements in sub-clause 4.2.2.3 shall apply.

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

The requirements in sub-clause 4.2.2.4 shall apply.

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

The requirements in sub-clause 4.2.2.5 shall apply.

#### 5.1.2.6 Maximum interruption in paging reception

The requirements in sub-clause 4.2.2.6 shall apply.

#### 5.1.2.7 General requirements

The requirements in sub-clause 4.2.2.7 shall apply.

#### 5.2 Void

## 6 RRC\_CONNECTED state mobility

#### 6.1 Handover

#### 6.1.1 NR Handover

#### 6.1.1.1 Introduction

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

#### 6.1.1.2 NR FR1 - NR FR1 Handover

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

#### 6.1.1.2.1 Handover delay

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

When the UE receives a RRC message implying handover the UE shall be ready to start the transmission of the new uplink PRACH channel within D<sub>handover</sub> seconds from the end of the last TTI containing the RRC command.

#### Where:

D<sub>handover</sub> equals the maximum RRC procedure delay to be defined in clause 12 in TS 38.331 [2] plus the interruption time stated in clause 6.1.1.2.2.

#### 6.1.1.2.2 Interruption time

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

When intra-frequency or inter-frequency handover is commanded, the interruption time shall be less than T<sub>interrupt</sub>

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

#### Where:

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

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

T<sub>processing</sub> is time for UE processing. T<sub>processing</sub> can be up to 20ms.

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

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

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

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

NOTE 1: The actual value of T<sub>IU</sub> shall depend upon the PRACH configuration used in the target cell.

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

#### 6.1.1.3 NR FR2- NR FR1 Handover

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

#### 6.1.1.3.1 Handover delay

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

When the UE receives a RRC message implying handover the UE shall be ready to start the transmission of the new uplink PRACH channel within D<sub>handover</sub> seconds from the end of the last TTI containing the RRC command.

Where:

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

#### 6.1.1.3.2 Interruption time

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

When intra-frequency or inter-frequency handover is commanded, the interruption time shall be less than T<sub>interrupt</sub>

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

#### Where:

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

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

T<sub>processing</sub> is time for UE processing. T<sub>processing</sub> can be up to 40ms.

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

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

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

NOTE 1: The actual value of T<sub>IU</sub> shall depend upon the PRACH configuration used in the target cell.

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

#### 6.1.1.4 NR FR2- NR FR2 Handover

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

#### 6.1.1.4.1 Handover delay

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

When the UE receives a RRC message implying handover the UE shall be ready to start the transmission of the new uplink PRACH channel within D<sub>handover</sub> seconds from the end of the last TTI containing the RRC command.

#### Where:

D<sub>handover</sub> equals the maximum RRC procedure delay to be defined in clause 12 in TS 38.331 [2] plus the interruption time stated in clause 6.1.1.4.2.

#### 6.1.1.4.2 Interruption time

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

When intra-frequency or inter-frequency handover is commanded, the interruption time shall be less than T<sub>interrupt</sub>

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

#### Where:

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

T<sub>processing</sub> is time for UE processing. T<sub>processing</sub> can be up to 20ms.

T<sub>margin</sub> is time for SSB post-processing. T<sub>margin</sub> can be up to 2ms.

 $T_{\Delta}$  is time for fine time tracking and acquiring full timing information of the target cell.  $T_{\Delta} = 1 * T_{rs}$  for both known and unknown target cell.

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

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

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

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

- the UE has sent a valid measurement report for the target cell and
- One of the SSBs measured from the NR target cell being configured remains detectable according to the cell identification conditions specified in clause 9.3 of TS 38.133 [50],
- One of the SSBs measured from the target cell also remains detectable during the handover delay according to the cell identification conditions specified in clause 9.3 of TS 38.133 [50].

otherwise it is unknown.

NOTE 1: The actual value of T<sub>IU</sub> shall depend upon the PRACH configuration used in the target cell.

#### 6.1.1.5 NR FR1- NR FR2 Handover

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

#### 6.1.1.5.1 Handover delay

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

When the UE receives a RRC message implying handover the UE shall be ready to start the transmission of the new uplink PRACH channel within D<sub>handover</sub> seconds from the end of the last TTI containing the RRC command.

#### Where:

D<sub>handover</sub> equals the maximum RRC procedure delay to be defined in clause 12 in TS 38.331 [2] plus the interruption time stated in clause 6.1.1.5.2.

#### 6.1.1.5.2 Interruption time

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

When inter-frequency handover is commanded, the interruption time shall be less than T<sub>interrupt</sub>

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

#### Where:

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

T<sub>processing</sub> is time for UE processing. T<sub>processing</sub> can be up 40ms.

T<sub>margin</sub> is time for SSB post-processing. T<sub>margin</sub> can be up to 2ms.

 $T_{\Delta}$  is time for fine time tracking and acquiring full timing information of the target cell.  $T_{\Delta} = 1 * T_{rs}$  for both known and unknown target cell.

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

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

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

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

- the UE has sent a valid measurement report for the target cell and
- One of the SSBs measured from the NR target cell being configured remains detectable according to the cell identification conditions specified in clause 9.3 of TS 38.133 [50],
- One of the SSBs measured from the target cell also remains detectable during the handover delay according to the cell identification conditions specified in clause 9.3 of TS 38.133 [50].

otherwise it is unknown.

NOTE 1: The actual value of T<sub>IU</sub> shall depend upon the PRACH configuration used in the target cell.

## 6.1.2 NR Handover to other RATs

#### 6.1.2.1 NR – E-UTRAN Handover

#### 6.1.2.1.1 Introduction

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

## 6.1.2.1.2 Handover delay

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

$$D_{handover} = T_{RRC procedure delay} + T_{interrupt}$$

Where:

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

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

## 6.1.2.1.3 Interruption time

When the inter-RAT handover to E-UTRAN is commanded, the interruption time shall be less than Tinterrupt

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

Where:

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

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

NOTE: The actual value of T<sub>IU</sub> shall depend upon the PRACH configuration used in the target cell.

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

# 6.2 RRC Connection Mobility Control

## 6.2.1 SA: RRC Re-establishment

## 6.2.1.1 Introduction

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

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

## 6.2.1.2 Requirements

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

$$T_{re-establish\ delay} = T_{UE\ re-establish\ delay} + T_{UL\ grant}$$

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

The UE re-establishment delay (T<sub>UE\_re-establish\_delay</sub>) is specified in clause 6.2.1.2.1.

## 6.2.1.2.1 UE Re-establishment delay requirement

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

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

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

- SS-RSRP related side conditions given in clause 10.1.2 and 10.1.3 are fulfilled for a corresponding NR Band for FR1 and FR2, respectively, and
- the conditions of SSB RP and SSB Ês/Iot according to Annex B.2.2 for a corresponding NR Band are fulfilled.

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

- SS-RSRP related side conditions given in clause 10.1.4 and 10.1.5 are fulfilled for a corresponding NR Band for FR1 and FR2, respectively, and
- the conditions of SSB RP and SSB Ês/Iot according to Annex B.2.3 for a corresponding NR Band are fulfilled.

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

T<sub>identify\_inter\_NR,i</sub>: It is the time to identify the target inter-frequency NR cell on inter-frequency carrier *i* configured for RRC re-establishment and it depends on whether the target NR cell is known cell or unknown cell and on the frequency range (FR) of the target NR cell. T<sub>identify inter NR,i</sub> shall not exceed the values defined in Table 6.2.1.2.1-2.

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

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

T<sub>SI-NR</sub>: It is the time required for receiving all the relevant system information according to the reception procedure and the RRC procedure delay of system information blocks defined in TS 38.331 [2] for the target NR cell.

T<sub>PRACH</sub>: It is the delay uncertainty in acquiring the first available PRACH occasion in the target NR cell. T<sub>PRACH</sub> can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [3].

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

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

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

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

Serving cell	Frequency range	Tidentify_intra_NR [ms]		
SSB Ês/lot (dB)	(FR) of target NR cell	Known NR cell	Unknown NR cell	
≥ -8	FR1	MAX (200 ms, 5 x T <sub>SMTC</sub> )	MAX (800 ms, 10 x T <sub>SMTC</sub> )	
≥ -8	FR2	N/A	MAX (1000 ms, 80 x T <sub>SMTC</sub> ))	
< -8	FR1	N/A	800 <sup>Note1</sup>	
< -8	FR2	N/A	3520 <sup>Note1</sup>	

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

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

Serving cell SSB	Frequency range	Tidentify_inter_NR, i [ms]	
Ês/lot (dB)	(FR) of target NR cell	Known NR cell	Unknown NR cell
≥ -8	FR1	MAX (200 ms, 6 x T <sub>SMTC, i</sub> )	MAX (800 ms, 13 x T <sub>SMTC, i</sub> )
≥ -8	FR2	N/A	MAX (1000 ms, 104 x T <sub>SMTC, i</sub> ))
< -8	FR1	N/A	800 <sup>Note1</sup>
< -8	FR2	N/A	4000 <sup>Note1</sup>

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

## 6.2.2 Random access

## 6.2.2.1 Introduction

This clause contains requirements on the UE regarding random access procedure. The random access procedure is initiated to establish uplink time synchronization for a UE which either has not acquired or has lost its uplink synchronization, or to convey UE's request Other SI, or for beam failure recovery. The random access is specified in clause 8 of TS 38.213 [3] and the control of the RACH transmission is specified in clause 5.1 of TS 38.321 [7].

#### 6.2.2.2 Requirements

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

have an accuracy as specified in Table 6.3.4.3-1 of TS 38.101-1 [18] for frequency range 1 and clause 6.3.4.3 of TS38.101-2 [19] for frequency range 2.

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

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

#### 6.2.2.2.1 Contention based random access

### 6.2.2.2.1.1 Correct behaviour when transmitting Random Access Preamble

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

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

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

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

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

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

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

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

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

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

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

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

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

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

#### 6.2.2.2.2 Non-Contention based random access

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

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

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

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

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

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

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

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

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

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

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

## 6.2.2.2.3 UE behaviour when configured with supplementary UL

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

## 6.2.3 SA: RRC Connection Release with Redirection

#### 6.2.3.1 Introduction

This clause contains requirements on the UE regarding RRC connection release with redirection procedure. RRC connection release with redirection is initiated by the *RRCRelease* message with redirection to E-UTRAN or NR from NR specified in TS 38.331 [2]. The RRC connection release with redirection procedure is specified in clause 5.3.8 of TS 38.331 [2].

## 6.2.3.2 Requirements

#### 6.2.3.2.1 RRC connection release with redirection to NR

The UE shall be capable of performing the RRC connection release with redirection to the target NR cell within  $T_{\text{connection release redirect NR}}$ .

The time delay (T<sub>connection\_release\_redirect\_NR</sub>) is the time between the end of the last slot containing the RRC command, "RRCRelease" (TS 38.331 [2]) on the NR PDSCH and the time the UE starts to send random access to the target NR cell. The time delay (T<sub>connection\_release\_redirect\_NR</sub>) shall be less than:

$$T_{connection release redirect NR} = T_{RRC procedure delay} + T_{identify-NR} + T_{SI-NR} + T_{RACH}$$

The target NR cell shall be considered detetable when for each relevant SSB, the side conditions should be met that,

- the conditions of SSB RP and SSB Es/Iot according to Annex B.2.5 for a corresponding NR Band are fulfilled.

 $T_{RRC\_procedure\_delay}$ : It is the RRC procedure delay for processing the received message "RRCRelease" as defined in clause 6.2.2 of TS 38.331 [2].

 $T_{identify-NR}$ : It is the time to identify the target NR cell and depends on the frequency range (FR) of the target NR cell. It is defined in Table 6.2.3.2.1-1. Note that  $T_{identify-NR} = T_{PSS/SSS-sync} + T_{meas}$ , in which  $T_{PSS/SSS-sync}$  is the cell search time and  $T_{meas}$  is the measurement time due to cell selection criteria evaluation.

 $T_{SI-NR}$ : It is the time required for acquiring all the relevant system information of the target NR cell. This time depends upon whether the UE is provided with the relevant system information of the target NR cell or not by the old NR cell before the RRC connection is released.

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

 $T_{rs}$  is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cell in the redirection command, otherwise  $T_{rs}$  is the SMTC periodicity configured in the *measObjectNR* having the same SSB frequency and subcarrier spacing configured for the RRC connection release with redirection. If the UE is not provided with SMTC configuration or measurement object for the frequency which is also configured for the RRC connection release with redirection then:

- the requirement in this clause is applied with  $T_{rs} = 20$  ms if the SSB transmission periodicity is not larger than 20 ms; otherwise,
- there is no requirement if the SSB transmission periodicity is larger than 20ms.

Table 6.2.3.2.1-1: Time to identify target NR cell for RRC connection release with redirection to NR

Frequency range (FR) of target NR cell		Tidentify-NR
FR1		MAX (680 ms, 11 x T <sub>rs</sub> )
FR2		MAX (880 ms, 8x11 x T <sub>rs</sub> )
Note:	If the UE has been provided with h	nigher layer signaling of smtc2 specified in TS 38.331 [2] prior to the
	redirection command, T <sub>rs</sub> follows s	smtc1 or smtc2 according to the physical cell ID of the target cell.

#### 6.2.3.2.2 RRC connection release with redirection to E-UTRAN

The UE shall be capable of performing the RRC connection release with redirection to the target E-UTRAN cell within  $T_{\text{connection release redirect E-UTRA}$ .

The time delay (T<sub>connection\_release\_redirect\_E-UTRA</sub>) is the time between the end of the last slot containing the RRC command, "RRCRelease" (TS 38.331 [2]) on the PDSCH and the time the UE starts to send random access to the target E-UTRA cell. The time delay (T<sub>connection\_release\_redirect\_E-UTRA</sub>) shall be less than:

$$T_{connection\_release\_redirect\_E-UTRA} = T_{RRC\_procedure\_delay} + T_{identify-E-UTRA} + T_{SI-E-UTRA} + T_{RACH}$$

The target E-UTRA FDD or TDD cell shall be considered detectable provided the following conditions are fulfilled:

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

 $T_{RRC\_procedure\_delay}$ : It is the RRC procedure delay for processing the received message "*RRCRelease*" as defined in clause 6.2.2 of TS 38.331 [2].

T<sub>identify-E-UTRA</sub>: It is the time to identify the target E-UTRA cell. It shall be less than 320 ms.

T<sub>SI-E-UTRA</sub>: It is the time required for acquiring all the relevant system information of the target E-UTRA cell. This time depends upon whether the UE is provided with the relevant system information (SI) of the target E-UTRA cell or not by the old NR cell before the RRC connection is released.

T<sub>RACH</sub>: It is the delay caused due to the random access procedure when sending random access to the target E-UTRA

# 7 Timing

# 7.1 UE transmit timing

## 7.1.1 Introduction

The UE shall have capability to follow the frame timing change of the reference cell in connected state. The uplink frame transmission takes place  $(N_{TA} + N_{TA \text{ offset}}) \times T_c$  before the reception of the first detected path (in time) of the corresponding downlink frame from the reference cell. For serving cell(s) in PTAG, UE shall use the SpCell as the reference cell for deriving the UE transmit timing for cells in the PTAG. For serving cell(s) in STAG, UE shall use any of the activated SCells as the reference cell for deriving the UE transmit timing for the cells in the STAG. UE initial transmit timing accuracy, gradual timing adjustment requirements and one shot timing adjustment requirements are defined in the following requirements.

# 7.1.2 Requirements

The UE initial transmission timing error shall be less than or equal to  $\pm T_e$  where the timing error limit value  $T_e$  is specified in Table 7.1.2-1. This requirement applies:

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

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

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

Frequency Range	SCS of SSB signals ( kHz)	SCS of uplink signals ( kHz)	Te
		15	12*64*T <sub>c</sub>
	15	30	10*64*T <sub>c</sub>
1		60	10*64*T <sub>c</sub>
'	30	15	8*64*T <sub>c</sub>
		30	8*64*T <sub>c</sub>
		60	7*64*T <sub>c</sub>
	120	60	3.5*64*T <sub>c</sub>
2	120	120	3.5*64*T <sub>c</sub>
2	240	60	3*64*Tc
		120	3*64*Tc
Note 1: T <sub>c</sub> is	T <sub>c</sub> is the basic timing unit defined in TS 38.211 [6]		

Table 7.1.2-1: Te Timing Error Limit

Table 7.1.2-2: The Value of  $N_{\mathrm{TA~offset}}$ 

Freque	ncy range and band of cell used for uplink transmission	N <sub>TA offset</sub> (Unit: Tc)	
FR1 FDD	band without LTE-NR coexistence case or	25600 (Note 1)	
FR1 TDD	band without LTE-NR coexistence case		
FR1 FDD	band with LTE-NR coexistence case	0 (Note 1)	
FR1 TDD	band with LTE-NR coexistence case	39936 (Note 1)	
FR2		13792	
Note 1:	The UE identifies $N_{ m TA~offset}$ based on the information n-		
	TimingAdvanceOffset as specified in TS 38.331 [2]. If UE is not provided with the information n-TimingAdvanceOffset, the default value of $N_{\mathrm{TA~offset}}$		
	is set as 25600 for FR1 band. In case of multiple UL carriers in the same TAG, UE expects that the same value of n-TimingAdvanceOffset is provided for all the UL carriers according to clause 4.2 in TS 38.213 [3] and the value 39936 of $N_{\mathrm{TA~offset}}$ can also be provided for a FDD serving cell.		
Note 2:	Void		

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

#### Table 7.1.2-3: void

## 7.1.2.1 Gradual timing adjustment

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

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

- 2) The minimum aggregate adjustment rate shall be T<sub>p</sub> per second.
- 3) The maximum aggregate adjustment rate shall be  $T_q$  per 200 ms.

where the maximum autonomous time adjustment step  $T_q$  and the aggregate adjustment rate  $T_p$  are specified in Table 7.1.2.1-1.

Table 7.1.2.1-1:  $T_q$  Maximum Autonomous Time Adjustment Step and  $T_p$  Minimum Aggregate Adjustment rate

Frequency Range	SCS of uplink signals (kHz)	Tq	Тр
	15	5.5*64*T <sub>c</sub>	5.5*64*Tc
1	30	5.5*64*T <sub>c</sub>	5.5*64*T <sub>c</sub>
	60	5.5*64*T <sub>c</sub>	5.5*64*T <sub>c</sub>
2	60	2.5*64*T <sub>c</sub>	2.5*64*T <sub>c</sub>
2	120	2.5*64*T <sub>c</sub>	2.5*64*Tc
NOTE: T <sub>c</sub> is the basic timing unit defined in TS 38.211 [6]			

## 7.1.2.2 One shot timing adjustment

When the magnitude of the  $\Delta T$  exceeds H then the UE shall adjust its transmission timing in one adjustment only once provided that the following conditions are met at the UE. Otherwise when the magnitude of the  $\Delta T \leq H$  then the UE shall adjust its transmission timing according to the rules defined in clause 7.1.2.1.

- SSB\_RP and SSB Ês/Iot according to Annex B.2.6.1 for a corresponding operating Band,

The UE transmit timing immediately after applying the one shot timing adjustment shall be:  $T_2 - (N_{TA} + N_{TA \text{ offset}}) + 2 \times (T_1 - T_2)$ . After applying the one shot timing adjustment the UE shall adjust its transmission timing according to the rules defined in clause 7.1.2.1.

Where:  $\Delta T = |T_1 - T_2|$ 

- T<sub>1</sub> is the reception time at the UE just before the one shot timing adjustment,
- T<sub>2</sub> is the reception time to be used at the UE just after the one shot timing adjustment,
- H is defined in table 7.1.2.2-1.

Table 7.1.2.2-1: The value of H

Frequency Range	SCS of SSB signals (kHz)	SCS of uplink signals s(kHz)	H [Tc]
		15	TBD
	15	30	TBD
1		60	TBD
ı	30	15	TBD
		30	TBD
		60	TBD
	120	60	TBD
2	120	120	TBD
	240	60	TBD
	240	120	TBD

# 7.2 UE timer accuracy

## 7.2.1 Introduction

UE timers are used in different protocol entities to control the UE behaviour.

## 7.2.2 Requirements

For UE timers specified in TS 38.331 [2], the UE shall comply with the timer accuracies according to Table 7.2.2-1.

The requirements are only related to the actual timing measurements internally in the UE. They do not include the following:

- Inaccuracy in the start and stop conditions of a timer (e.g. UE reaction time to detect that start and stop conditions of a timer is fulfilled), or
- Inaccuracies due to restrictions in observability of start and stop conditions of a UE timer (e.g. slot alignment when UE sends messages at timer expiry).

Table 7.2.2-1

Timer value [s]	Accuracy
timer value < 4	± 0.1s
timer value ≥ 4	± 2.5%

# 7.3 Timing advance

## 7.3.1 Introduction

The timing advance is initiated from gNB to UE in EN-DC, NR-DC, NE-DC and NR SA operation modes,, with MAC message that implies and adjustment of the timing advance, as defined in clause 5.2 of TS 38.321 [7].

## 7.3.2 Requirements

## 7.3.2.1 Timing Advance adjustment delay

UE shall adjust the timing of its uplink transmission timing at time slot n+k+1 for a timing advance command received in time slot n, and the value of k is defined in clause 4.2 in TS 38.213 [3]. The same requirement applies also when the UE is not able to transmit a configured uplink transmission due to the channel assessment procedure.

## 7.3.2.2 Timing Advance adjustment accuracy

The UE shall adjust the timing of its transmissions with a relative accuracy better than or equal to the UE Timing Advance adjustment accuracy requirement in Table 7.3.2.2-1, to the signalled timing advance value compared to the timing of preceding uplink transmission. The timing advance command step is defined in TS 38.213 [3].

Table 7.3.2.2-1: UE Timing Advance adjustment accuracy

UL Sub Carrier Spacing(kHz)	15	30	60	120
UE Timing Advance adjustment accuracy	±256 T <sub>c</sub>	±256 T <sub>c</sub>	±128 T <sub>c</sub>	±32 T <sub>c</sub>

# 7.4 Cell phase synchronization accuracy

## 7.4.1 Definition

Cell phase synchronization accuracy for TDD is defined as the maximum absolute deviation in frame start timing between any pair of cells on the same frequency that have overlapping coverage areas.

# 7.4.2 Minimum requirements

The cell phase synchronization accuracy measured at BS antenna connectors shall be better than 3 µs.

# 7.5 Maximum Transmission Timing Difference

## 7.5.1 Introduction

A UE shall be capable of handling a relative transmission timing difference between subframe timing boundary of E-UTRA PCell and the closest slot timing boundary of PSCell to be aggregated for EN-DC operation.

A UE shall be capable of handling a relative transmission timing difference among the closest slot timing boundaries of different carriers to be aggregated in NR carrier aggregation.

A UE shall be capable of handling a relative transmission timing difference between slot timing boundary of PCell and subframe timing boundary of E-UTRA PSCell to be aggregated for NE-DC operation.

A UE shall be capable of handling a relative transmission timing difference between slot timing boundaries of PCell and the closest slot timing boundary of PSCell to be aggregated in NR DC operation.

## 7.5.2 Minimum Requirements for inter-band EN-DC

The UE shall be capable of handling a maximum uplink transmission timing difference between E-UTRA PCell and PSCell as shown in Table 7.5.2-1.

Table 7.5.2-1 Maximum uplink transmission timing difference requirement for asynchronous EN-DC

Sub-carrier spacing in E-UTRA PCell (kHz)	UL Sub-carrier spacing for data in PSCell (kHz)	Maximum uplink transmission timing difference (µs)
15	15	500
15	30	250
15	60	125
15	120 <sup>Note1</sup>	62.5

NOTE 1: For E-UTRA FDD-NR FDD intra-band EN-DC, for which the requirement is defined in clause 7.5.3 and this Table 7.5.2-1 is also applicable, the scenario with 120kHz PSCell does not exist.

**Table 7.5.2-2 Void** 

## 7.5.2.1 Minimum Requirements for inter-band synchronous EN-DC

The requirements in this clause apply as a reference for inter-band synchronous EN-DC.

The UE shall be capable of handling a maximum uplink transmission timing difference between E-UTRA PCell and PSCell for inter-band synchronous EN-DC as shown in Table 7.5.2.1-1 1. The requirements for synchronous EN-DC are applicable for E-UTRA TDD-NR TDD, E-UTRA FDD-NR FDD, E-UTRA TDD-NR FDD and E-UTRA FDD-NR TDD inter-band EN-DC.

Table 7.5.2.1-1 Maximum uplink transmission timing difference requirement for inter-band synchronous EN-DC

Sub-carrier spacing in E- UTRA PCell (kHz)	UL Sub-carrier spacing for data in PSCell (kHz)	Maximum uplink transmission timing difference (µs)
15	15	35.21
15	30	35.21
15	60	35.21
15	120	35.21

## 7.5.3 Minimum Requirements for intra-band EN-DC

For intra-band EN-DC, only co-located deployment is applied.

The UE shall be capable of handling a maximum uplink transmission timing difference between E-UTRA PCell and PSCell as shown in Table 7.5.2-1 for E-UTRA FDD-NR FDD intra-band EN-DC provided the UE indicates that it is capable of asynchronous EN-DC operation [2].

The UE shall be capable of handling a maximum uplink transmission timing difference between E-UTRA PCell and PSCell as shown in Table 7.5.3-1 for E-UTRA TDD-NR TDD and E-UTRA FDD-NR FDD intra-band EN-DC provided the UE does not indicate that it is capable of asynchronous FDD-FDD EN-DC operation [16].

Table 7.5.3-1: Maximum uplink transmission timing difference requirement for intra-band synchronous EN-DC

Sub-carrier spacing	UL Sub-carrier	Maximum uplink		
in E-UTRA PCell	spacing for data in PSCell (kHz)	transmission timing		
(kHz)	PSCell (KHZ)	difference (µs)		
15	15	5.21 <sup>Note1,Note 2</sup>		
15	30	5.21 <sup>Note 2</sup>		
15	60	5.21 Note 2		
NOTE 1: This is not applicable for a UE which indicates the capability of only				

NOTE 1: This is not applicable for a UE which indicates the capability of only supporting single UL timing (*ul-TimingAlignmentEUTRA-NR* is signalled). Single UL timing for E-UTRA and NR cell is assumed for this UE.

NOTE 2: If the transmission timing difference exceeds the cyclic prefix length of the UL Sub-carrier spacing for data in PSCell, NR UE Tx EVM degradation is expected for the symbol that is overlapping the LTE subframe boundary

## 7.5.4 Minimum Requirements for NR Carrier Aggregation

The UE shall be capable of handling at least a relative transmission timing difference between slot timing of all pairs of TAGs as shown in Table 7.5.4-1, provided that the UE is:

- configured with the pTAG and the sTAG for inter-band NR carrier aggregation in SA or NR-DC mode, or
- configured with more than one sTAG for inter-band NR carrier aggregation in EN-DC or NE-DC mode.

Table 7.5.4-1: Maximum uplink transmission timing difference requirement for inter-band NR carrier aggregation

Frequency Range of the pair of TAGs	Maximum uplink transmission timing difference (μs)
FR1	34.6
FR2	8.5
Between FR1 and FR2	26.1

# 7.5.5 Minimum Requirements for inter-band NE-DC

The UE shall be capable of handling a maximum uplink transmission timing difference between PCell and E-UTRA PSCell as shown in Table 7.5.5-1 for inter-band asynchronous NE-DC.

Table 7.5.5-1: Maximum uplink transmission timing difference requirement for inter-band asynchronous NE-DC

Sub-carrier spacing in PCell (kHz)	UL Sub-carrier spacing for data in E-UTRA PSCell (kHz)	Maximum uplink transmission timing difference (μs)
15	15	500
30	15	250
60	15	125
120	15	62.5
NOTE 1: Void		

Table 7.5.5-2: Void

## 7.5.5.1 Minimum Requirements for inter-band synchronous NE-DC

The requirements in this clause apply as a reference for inter-band synchronous NE-DC.

The UE shall be capable of handling a maximum uplink transmission timing difference between PCell and E-UTRA PSCell for inter-band synchronous NE-DC as shown in Table 7.5.5.1-1. The requirements for synchronous NE-DC are applicable for NR TDD- E-UTRA TDD, NR FDD- E-UTRA FDD, NR TDD- E-UTRA FDD and NR FDD- E-UTRA TDD inter-band NE-DC.

Table 7.5.5.1-1: Maximum uplink transmission timing difference requirement for inter-band synchronous NE-DC

Sub-carrier spacing in PCell (kHz)	UL Sub-carrier spacing for data in E-UTRA PSCell (kHz)	Maximum uplink transmission timing difference (μs)
15	15	35.21
30	15	35.21
60	15	35.21
120	15	35.21

# 7.5.6 Minimum Requirements for inter-band NR DC

The UE shall be capable of handling a maximum uplink transmission timing difference between PCell and PSCell as shown in Table 7.5.6-1 provided that the UE indicates that it is capable of synchronous NR DC [16].

Table 7.5.6-1: Maximum uplink transmission timing difference requirement for inter-band synchronous NR DC

Frequenc	cy Range	Maximum uplink transmission
PCell	PSCell	timing difference (µs)
FR1	FR2	34.1

# 7.6 Maximum Receive Timing Difference

## 7.6.1 Introduction

A UE shall be capable of handling a relative receive timing difference between subframe timing boundary of a E-UTRA cell belonging to the MCG and the closest slot timing boundary of a cell belonging to SCG to be aggregated for EN-DC operation.

A UE shall be capable of handling a relative receive timing difference between subframe timing boundary of a E-UTRA cell belonging to the SCG to be aggregated for NE-DC operation and the closest slot timing boundary of a cell belonging to MCG.

A UE shall be capable of handling a relative receive timing difference between slot timing boundary of a cell belonging to MCG and the closest slot timing boundary of a cell belonging to the SCG to be aggregated for NR DC operation. A UE shall be capable of handling a relative receive timing difference among the closest slot timing boundaries of different carriers to be aggregated in NR carrier aggregation.

## 7.6.2 Minimum Requirements for inter-band EN-DC

The UE shall be capable of handling at least a relative receive timing difference between subframe timing of signal from a E-UTRA cell belonging to the MCG and slot timing of signal from a cell belonging to SCG at the UE receiver as shown in Table 7.6.2-1.

Table 7.6.2-1: Maximum receive timing difference requirement for asynchronous EN-DC

Sub-carrier spacing of E-UTRA cell in MCG (kHz)	DL Sub-carrier spacing of cell in SCG (kHz) (Note 1)	Maximum receive timing difference (µs)
15	15	500
15	30	250
15	60	125
15	120 <sup>Note2</sup>	62.5

NOTE 1: DL Sub-carrier spacing is min{SCS<sub>SS</sub>, SCS<sub>DATA</sub>}.

NOTE 2: For E-UTRA FDD-NR FDD intra-band EN-DC, for which the requirement is defined in clause 7.6.3 and this Table 7.6.2-1 is also applicable, the scenario with 120 kHz does not exit.

**Table 7.6.2-2: Void** 

**Table 7.6.2-3 Void** 

## 7.6.2.1 Minimum Requirements for inter-band synchronous EN-DC

The requirements in this clause apply as a reference for inter-band synchronous EN-DC.

The UE shall be capable of handling at least a relative receive timing difference between subframe timing of signal from a E-UTRA cell belonging to the MCG and slot timing of signal from a cell belonging to SCG at the UE receiver for inter-band synchronous EN-DC as shown in Table 7.6.2.1-1. The requirements for synchronous EN-DC are applicable for E-UTRA TDD-NR TDD, E-UTRA FDD-NR FDD, E-UTRA TDD-NR FDD and E-UTRA FDD-NR TDD inter-band EN-DC.

Table 7.6.2.1-1: Maximum receive timing difference requirement for inter-band synchronous EN-DC

Sub-carrier spacing of E-UTRA cell in MCGPCell (kHz)	DL Sub-carrier spacing of cell in SCG (kHz) (Note1)	Maximum receive timing difference (µs)
15	15	
15	30	33
15	60	33
15	120	
Note 1: DL Sub-carrier spacing is min{SCS <sub>SS</sub> , SCS <sub>DATA</sub> }.		

## 7.6.3 Minimum Requirements for intra-band EN-DC

For intra-band EN-DC, only co-located deployment is applied.

The UE shall be capable of handling at least a relative receive timing difference between subframe timing of signal from a E-UTRA cell belonging to the MCG and slot timing of signal from a cell belonging to the SCG as shown in Table 7.6.2-1 for E-UTRA FDD-NR FDD intra-band EN-DC provided the UE indicates that it is capable of asynchronous EN-DC operation [2].

The UE shall be capable of handling at least a relative receive timing difference between subframe timing of signal from a E-UTRA cell belonging to the MCG and slot timing of signal from a cell belonging to the SCG as shown in Table 7.6.3-1 for E-UTRA FDD-NR FDD and E-UTRA TDD-NR TDD intra-band EN-DC provided the UE does not indicate that it is capable of asynchronous FDD-FDD EN-DC operation [16].

Table 7.6.3-1 Maximum receive timing difference requirement for intra-band synchronous EN-DC

Sub-carrier spacing of E-UTRA cell in MCG (kHz)	DL Sub-carrier spacing of cell in SCG (kHz) <sup>Note1</sup>	Maximum receive timing difference (µs)
15	15	3
15	30	3
15	60	3
NOTE 1: DL Sub-carrier spacing is min{SCS <sub>SS</sub> , SCS <sub>DATA</sub> }.		

**Table 7.6.3-2 Void** 

# 7.6.4 Minimum Requirements for NR Carrier Aggregation

For intra-band CA, only co-located deployment is applied. For intra-band non-contiguous NR carrier aggregation, the UE shall be capable of handling at least a relative receive timing difference between slot timing of different carriers to be aggregated at the UE receiver as shown in Table 7.6.4-1 below.

Table 7.6.4-1: Maximum receive timing difference requirement for intra-band non-contiguous NR carrier aggregation

Frequ	iency Range	Maximum receive timing difference (µs)
	FR1	3 <sup>1</sup>
	FR2	0.26
Note 1:	In the case of different SCS on different CCs, if the receive time difference exceeds the cyclic prefix length of that SCS, demodulation performance degradation is expected for the first symbol of the slot.	

For inter-band NR carrier aggregation, the UE shall be capable of handling at least a relative receive timing difference between slot timing of all pairs of carriers to be aggregated at the UE receiver as shown in Table 7.6.4-2 below.

Table 7.6.4-2: Maximum receive timing difference requirement for inter-band NR carrier aggregation

Frequency Range of the pair of carriers	Maximum receive timing difference (μs)
FR1	33
FR2	8
Between FR1 and FR2	25

# 7.6.5 Minimum Requirements for inter-band NE-DC

The UE shall be capable of handling at least a relative receive timing difference between slot timing of signal from a cell belonging to the MCG and subframe timing of signal from a E-UTRA cell belonging to the SCG at the UE receiver for asynchronous NE-DC as shown in Table 7.6.5-1.

Table 7.6.5-1: Maximum receive timing difference requirement for asynchronous NE-DC

Sub-carrier spacing of cell in MCG (kHz)	DL Sub-carrier spacing of EUTRA cell in SCG (kHz) (Note 1)	Maximum receive timing difference (μs)
15	15	500
30	15	250
60	15	125
120	15	62.5
NOTE 1: DL Sub-carrier spacing is min{SCS <sub>SS</sub> , SCS <sub>DATA</sub> }.  NOTE 2: Void		

Table 7.6.5-2: Void

## 7.6.5.1 Minimum Requirements for inter-band synchronous NE-DC

The requirements in this clause apply as a reference for inter-band synchronous NE-DC.

The UE shall be capable of handling at least a relative receive timing difference between slot timing of signal from a cell belonging to the MCG and subframe timing of signal from a E-UTRA cell belonging to the SCG at the UE receiver for inter-band synchronous NE-DC as shown in Table 7.6.5.1-1. The requirements for synchronous NE-DC are applicable for NR TDD- E-UTRA TDD, NR FDD- E-UTRA FDD, NR TDD- E-UTRA FDD and NR FDD- E-UTRA TDD inter-band NE-DC.

Table 7.6.5.1-1: Maximum receive timing difference requirement for inter-band synchronous NE-DC

Sub-carrier spacing of cell in MCG (kHz)	DL Sub-carrier spacing of EUTRA cell in SCG (kHz) (Note1)	Maximum receive timing difference (µs)
15	15	
30	15	33
60	15	
120	15	

## 7.6.6 Minimum Requirements for inter-band NR DC

The UE shall be capable of handling at least a relative receive timing difference between slot timing of signal from a cell belonging to the MCG and slot timing of signal from a cell belonging to the SCG at the UE receiver as shown in Table 7.6.6-1 provided that the UE indicates that it is capable of synchronous NR DC [16].

Table 7.6.6-1: Maximum receive timing difference requirement for inter-band synchronous NR DC

Frequen	cy Range	Maximum receive timing
Cell in	Cell in	difference (µs)
MCG	SCG	
FR1	FR2	33

## 7.7 *deriveSSB-IndexFromCell* tolerance

# 7.7.1 Minimum requirements

When *deriveSSB-IndexFromCell* is enabled, the UE assumes frame boundary alignment (including half frame, subframe and slot boundary alignment) across cells on the same frequency carrier is within a tolerance not worse than min(2 SSB symbols, 1 PDSCH symbol) and the SFNs of all cells on the same frequency carrier are the same.

## 7.8 Void

# 8 Signalling characteristics

# 8.1 Radio Link Monitoring

## 8.1.1 Introduction

The requirements in clause 8.1 apply for radio link monitoring on:

- PCell in SA NR, NR-DC and NE-DC operation mode,
- PSCell in NR-DC and EN-DC operation mode.

The UE shall monitor the downlink radio link quality based on the reference signal configured as RLM-RS resource(s) in order to detect the downlink radio link quality of the PCell and PSCell as specified in TS 38.213 [3]. The configured RLM-RS resources can be all SSBs, or all CSI-RSs, or a mix of SSBs and CSI-RSs. UE is not required to perform RLM outside the active DL BWP.

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

The threshold  $Q_{out}$  is defined as the level at which the downlink radio link cannot be reliably received and shall correspond to the out-of-sync block error rate (BLER<sub>out</sub>) as defined in Table 8.1.1-1. For SSB based radio link monitoring,  $Q_{out\_SSB}$  is derived based on the hypothetical PDCCH transmission parameters listed in Table 8.1.2.1-1. For CSI-RS based radio link monitoring,  $Q_{out\_CSI-RS}$  is derived based on the hypothetical PDCCH transmission parameters listed in Table 8.1.3.1-1.

The threshold  $Q_{in}$  is defined as the level at which the downlink radio link quality can be received with significantly higher reliability than at  $Q_{out}$  and shall correspond to the in-sync block error rate (BLER<sub>in</sub>) as defined in Table 8.1.1-1. For SSB based radio link monitoring,  $Q_{in\_SSB}$  is derived based on the hypothetical PDCCH transmission parameters listed in Table 8.1.2.1-2. For CSI-RS based radio link monitoring,  $Q_{in\_CSI-RS}$  is derived based on the hypothetical PDCCH transmission parameters listed in Table 8.1.3.1-2.

The out-of-sync block error rate (BLER<sub>out</sub>) and in-sync block error rate (BLER<sub>in</sub>) are determined from the network configuration via parameter *rlmInSyncOutOfSyncThreshold* signalled by higher layers. When UE is not configured with *rlmInSyncOutOfSyncThreshold* from the network, UE determines out-of-sync and in-sync block error rates from Configuration #0 in Table 8.1.1-1 by default. All requirements in clause 8.1 are applicable for BLER Configuration #0 in Table 8.1.1-1.

Table 8.1.1-1: Out-of-sync and in-sync block error rates

Configuration	BLERout	BLERin
0	10%	2%

UE shall be able to monitor up to  $N_{RLM}$  RLM-RS resources of the same or different types in each corresponding carrier frequency range, depending on a maximum number  $L_{max}$  of candidate SSBs per half frame according to TS 38.213 [3], where  $N_{RLM}$  is specified in Table 8.1.1-2, and meet the requirements as specified in clause 8.1. UE is not required to meet the requirements in clause 8.1 if RLM-RS is not configured and no TCI state for PDCCH is activated.

Table 8.1.1-2: Maximum number of RLM-RS resources N<sub>RLM</sub>

Carrier frequency range of PCell/PSCell	$L_{ m max}$	Maximum number of RLM-RS resources, N <sub>RLM</sub>
FR1, ≤ 3 GHz <sup>Note</sup>	4	2
FR1, > 3 GHz <sup>Note</sup>	8	4
FR2	64	8
NOTE: For unpaired spectrum op	•	z is replaced by 2.4GHz, as specified in

# 8.1.2 Requirements for SSB based radio link monitoring

## 8.1.2.1 Introduction

The requirements in this clause apply for each SSB based RLM-RS resource configured for PCell or PSCell, provided that the SSB configured for RLM is actually transmitted within UE active DL BWP during the entire evaluation period specified in clause 8.1.2.2.

Table 8.1.2.1-1: PDCCH transmission parameters for out-of-sync evaluation

Attribute	Value for BLER Configuration #0	
DCI format	1-0	
Number of control OFDM symbols	2	
Aggregation level (CCE)	8	
Ratio of hypothetical PDCCH RE energy to average SSS RE energy	4dB	
Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	4dB	
Bandwidth (PRBs)	24	
Sub-carrier spacing (kHz)	SCS of the active DL BWP	
DMRS precoder granularity	REG bundle size	
REG bundle size	6	
CP length	Normal	
Mapping from REG to CCE	Distributed	

Table 8.1.2.1-2: PDCCH transmission parameters for in-sync evaluation

Attribute	Value for BLER Configuration #0	
DCI payload size	1-0	
Number of control OFDM symbols	2	
Aggregation level (CCE)	4	
Ratio of hypothetical PDCCH RE energy to average SSS RE energy	0dB	
Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	0dB	
Bandwidth (PRBs)	24	
Sub-carrier spacing (kHz)	SCS of the active DL BWP	
DMRS precoder granularity	REG bundle size	
REG bundle size	6	
CP length	Normal	
Mapping from REG to CCE	Distributed	

## 8.1.2.2 Minimum requirement

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

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

T<sub>Evaluate out SSB</sub> and T<sub>Evaluate in SSB</sub> are defined in Table 8.1.2.2-1 for FR1.

T<sub>Evaluate out SSB</sub> and T<sub>Evaluate in SSB</sub> are defined in Table 8.1.2.2-2 for FR2 with scaling factor N=8.

#### For FR1.

- $P = \frac{1}{1 \frac{T_{SSB}}{MRGP}}$ , when in the monitored cell there are measurement gaps configured for intra-frequency, interfrequency or inter-RAT measurements, and these measurement gaps are overlapping with some but not all occasions of the SSB; and
- P = 1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the SSB.

#### For FR2,

- $P = \frac{1}{1 \frac{T_{SSB}}{T_{SMTCperiod}}}$ , when RLM-RS resource is not overlapped with measurement gap and the RLM-RS resource is partially overlapped with SMTC occasion ( $T_{SSB} < T_{SMTCperiod}$ ).
- P is  $P_{\text{sharing factor}}$ , when the RLM-RS resource is not overlapped with measurement gap and RLM-RS resource is fully overlapped with SMTC period ( $T_{\text{SSB}} = T_{\text{SMTCperiod}}$ ).
- $P = \frac{1}{1 \frac{T_{SSB}}{MRGP} \frac{T_{SSB}}{T_{SMTCperiod}}}$ , when the RLM-RS resource is partially overlapped with measurement gap and the

RLM-RS resource is partially overlapped with SMTC occasion ( $T_{SSB} < T_{SMTCperiod}$ ) and SMTC occasion is not overlapped with measurement gap and

- $T_{SMTCperiod} \neq MGRP$  or
- $T_{SMTCperiod} = MGRP$  and  $T_{SSB} < 0.5 \times T_{SMTCperiod}$
- $P = \frac{P_{sharing\ factor}}{1 \frac{T_{SSB}}{MRGP}}$ , when the RLM-RS resource is partially overlapped with measurement gap and the RLM-RS resource is partially overlapped with SMTC occasion ( $T_{SSB} < T_{SMTCperiod}$ ) and SMTC occasion is not overlapped with measurement gap and  $T_{SMTCperiod} = MGRP$  and  $T_{SSB} = 0.5 \times T_{SMTCperiod}$
- $P = \frac{1}{1 \frac{T_{SSB}}{Min(MRGP,T_{SMTCperiod})}}$ , when the RLM-RS resource is partially overlapped with measurement gap and the

RLM-RS resource is partially overlapped with SMTC occasion ( $T_{SSB} \le T_{SMTCperiod}$ ) and SMTC occasion is partially or fully overlapped with measurement gap

- $P = \frac{P_{sharing\ factor}}{1 \frac{T_{SSB}}{MRGP}}$ , when the RLM-RS resource is partially overlapped with measurement gap and the RLM-RS resource is fully overlapped with SMTC occasion ( $T_{SSB} = T_{SMTCperiod}$ ) and SMTC occasion is partially overlapped with measurement gap ( $T_{SMTCperiod} < MGRP$ )
- $P_{sharing factor} = 1$ 
  - if all of the reference signals configured for RLM outside measurement gap are not fully overlapped by intrafrequency SMTC occasions, or
  - if all of the reference signal configured for RLM outside measurement gap and fully-overlapped by intrafrequency SMTC occasions are not overlapped by with the SSB symbols indicated by *SSB-ToMeasure* and 1 symbol before each consecutive SSB symbols indicated by *SSB-ToMeasure* and 1 symbol after each consecutive SSB symbols indicated by *SSB-ToMeasure*, given that *SSB-ToMeasure* is configured;

-  $P_{\text{sharing factor}} = 3$ , otherwise.

If the high layer in TS 38.331 [2] signaling of *smtc2* is present, T<sub>SMTCperiod</sub> follows *smtc2*; Otherwise T<sub>SMTCperiod</sub> follows *smtc1*.

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

Table 8.1.2.2-1: Evaluation period T<sub>Evaluate out SSB</sub> and T<sub>Evaluate in SSB</sub> for FR1

Configuration	T <sub>Evaluate_out_SSB</sub> (ms)	T <sub>Evaluate_in_SSB</sub> (ms)
no DRX	Max(200, Ceil(10 $\times$ P) $\times$ T <sub>SSB</sub> )	Max(100, Ceil(5 $\times$ P) $\times$ T <sub>SSB</sub> )
DRX cycle≤320ms	Max(200, Ceil(15 $\times$ P) $\times$	$Max(100, Ceil(7.5 \times P) \times Max(T_{DRX}, T_{SSB}))$
	Max(T <sub>DRX</sub> ,T <sub>SSB</sub> ))	
DRX cycle>320ms	$Ceil(10 \times P) \times T_{DRX}$	$Ceil(5 \times P) \times T_{DRX}$
NOTE: T <sub>SSB</sub> is the pe	riodicity of the SSB configured for RLM.	Γ <sub>DRX</sub> is the DRX cycle length.

Table 8.1.2.2-2: Evaluation period T<sub>Evaluate\_out\_SSB</sub> and T<sub>Evaluate\_in\_SSB</sub> for FR2

Configuration	T <sub>Evaluate_out_SSB</sub> (ms)	T <sub>Evaluate_in_SSB</sub> (ms)	
no DRX	Max(200, Ceil( $10 \times P \times N$ ) $\times T_{SSB}$ )	Max(100, Ceil(5 $\times$ P $\times$ N) $\times$ Tssb)	
DRX cycle≤320ms	Max(200, Ceil(15 $\times$ P $\times$ N) $\times$	Max(100, Ceil(7.5 $\times$ P $\times$ N) $\times$ Max(T <sub>DRX</sub> ,T <sub>SSB</sub> ))	
	Max(T <sub>DRX</sub> ,T <sub>SSB</sub> ))	, , , , , , , , , , , , , , , , , , , ,	
DRX cycle>320ms	Ceil( $10 \times P \times N$ ) $\times T_{DRX}$	Ceil(5 $\times$ P $\times$ N) $\times$ T <sub>DRX</sub>	
NOTE: T <sub>SSB</sub> is the periodicity of the SSB configured for RLM. T <sub>DRX</sub> is the DRX cycle length.			

#### 8.1.2.3 Measurement restrictions for SSB based RLM

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

For FR1, when the SSB for RLM is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD or L1-RSRP measurement,

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

For FR2, when the SSB for RLM is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD or L1-RSRP measurement, UE is required to measure one of but not both SSB for RLM and CSI-RS. Longer measurement period for SSB based RLM is expected, and no requirements are defined.

# 8.1.3 Requirements for CSI-RS based radio link monitoring

#### 8.1.3.1 Introduction

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

Table 8.1.3.1-1: PDCCH transmission parameters for out-of-sync evaluation

Attribute	Value for BLER Configuration #0
DCI format	1-0
Number of control OFDM symbols	2
Aggregation level (CCE)	8
Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	4dB
Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	4dB
Bandwidth (PRBs)	48
Sub-carrier spacing (kHz)	SCS of the active DL BWP
DMRS precoder granularity	REG bundle size
REG bundle size	6
CP length	Normal
Mapping from REG to CCE	Distributed

Table 8.1.3.1-2: PDCCH transmission parameters for in-sync evaluation

Attribute	Value for BLER Configuration #0
DCI payload size	1-0
Number of control OFDM symbols	2
Aggregation level (CCE)	4
Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	0dB
Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	0dB
Bandwidth (PRBs)	48
Sub-carrier spacing (kHz)	SCS of the active DL BWP
DMRS precoder granularity	REG bundle size
REG bundle size	6
CP length	Normal
Mapping from REG to CCE	Distributed

## 8.1.3.2 Minimum requirement

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

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

- T<sub>Evaluate\_out\_CSI-RS</sub> and T<sub>Evaluate\_in\_CSI-RS</sub> are defined in Table 8.1.3.2-1 for FR1.
- T<sub>Evaluate out CSI-RS</sub> and T<sub>Evaluate in CSI-RS</sub> are defined in Table 8.1.3.2-2 for FR2 with scaling factor N=1.

The requirements of  $T_{Evaluate\_out\_CSI-RS}$  and  $T_{Evaluate\_in\_CSI-RS}$  apply provided that the CSI-RS for RLM is not in a resource set configured with repetition ON. The requirements do not apply when the CSI-RS resource in the active TCI state of CORESET is the same CSI-RS resource for RLM and the TCI state information of the CSI-RS resource is not given, wherein the TCI state information means QCL Type-D to SSB for L1-RSRP or CSI-RS with repetition ON.

For FR1,

- $P = \frac{1}{1 \frac{T_{CSI-RS}}{MRGP}}$ , when in the monitored cell there are measurement gaps configured for intra-frequency, interfrequency or inter-RAT measurements, and these measurement gaps are overlapping with some but not all occasions of the CSI-RS; and
- P = 1, when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

#### For FR2,

- P = 1, when the RLM-RS resource is not overlapped with measurement gap and also not overlapped with SMTC occasion.
- $P = \frac{1}{1 \frac{T_{CSI-RS}}{MRGP}}$ , when the RLM-RS resource is partially overlapped with measurement gap and the RLM-RS resource is not overlapped with SMTC occasion (T<sub>CSI-RS</sub> < MGRP)
- $P = \frac{1}{1 \frac{T_{CSI-RS}}{T_{SMTCperiod}}}$ , when the RLM-RS resource is not overlapped with measurement gap and the RLM-RS resource is partially overlapped with SMTC occasion ( $T_{CSI-RS} < T_{SMTCperiod}$ ).
- P = 3, when the RLM-RS resource is not overlapped with measurement gap and RLM-RS resource is fully overlapped with SMTC occasion ( $T_{CSI-RS} = T_{SMTCperiod}$ ).
- $P = \frac{1}{1 \frac{T_{CSI-RS}}{MRGP} \frac{T_{CSI-RS}}{T_{SMTCperiod}}},$  when the RLM-RS resource is partially overlapped with measurement gap and the

RLM-RS resource is partially overlapped with SMTC occasion ( $T_{CSI-RS} \le T_{SMTCperiod}$ ) and SMTC occasion is not overlapped with measurement gap and

- $T_{SMTCperiod} \neq MGRP$  or
- $T_{SMTCperiod} = MGRP$  and  $T_{CSI-RS} < 0.5 \times T_{SMTCperiod}$
- $P = \frac{3}{1 \frac{T_{CSI-RS}}{MRGP}}$ , when the RLM-RS resource is partially overlapped with measurement gap and the RLM-RS resource is partially overlapped with SMTC occasion ( $T_{CSI-RS} < T_{SMTCperiod}$ ) and SMTC occasion is not overlapped with measurement gap and  $T_{SMTCperiod} = MGRP$  and  $T_{CSI-RS} = 0.5 \times T_{SMTCperiod}$
- $P = \frac{1}{1 \frac{T_{CSI-RS}}{Min(MRGP,T_{SMTCperiod})}}$ , when the RLM-RS resource is partially overlapped with measurement gap and the RLM-RS resource is partially overlapped with SMTC occasion (Test RS < Text Coords) and SMTC occasion is

RLM-RS resource is partially overlapped with SMTC occasion ( $T_{CSI-RS} \le T_{SMTCperiod}$ ) and SMTC occasion is partially or fully overlapped with measurement gap

-  $P = \frac{3}{1 - \frac{T_{CSI-RS}}{MRGP}}$ , when the RLM-RS resource is partially overlapped with measurement gap and the RLM-RS resource is fully overlapped with SMTC occasion ( $T_{CSI-RS} = T_{SMTCperiod}$ ) and SMTC occasion is partially overlapped with measurement gap ( $T_{SMTCperiod} < MGRP$ )

If the high layer in TS 38.331 [2] signaling of *smtc2* is present, T<sub>SMTCperiod</sub> follows *smtc2*; Otherwise T<sub>SMTCperiod</sub> follows *smtc1*.

Note: The overlap between CSI-RS for RLM and SMTC means that CSI-RS based RLM is within the SMTC window duration.

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

The values of  $M_{out}$  and  $M_{in}$  used in Table 8.1.3.2-1 and Table 8.1.3.2-2 are defined as:

-  $M_{out} = 20$  and  $M_{in} = 10$ , if the CSI-RS resource configured for RLM is transmitted with higher layer CSI-RS parameter *density* [6, clause 7.4.1] set to 3 and over the bandwidth  $\geq$  24 PRBs.

Table 8.1.3.2-1: Evaluation period  $T_{Evaluate\_out\_CSI\text{-RS}}$  and  $T_{Evaluate\_in\_CSI\text{-RS}}$  for FR1

Configuration	TEvaluate_out_CSI-RS (ms)	T <sub>Evaluate_in_</sub> CSI-RS (ms)
no DRX	Max(200, Ceil(M <sub>out</sub> ×P)×T <sub>CSI-RS</sub> )	$Max(100, Ceil(M_{in} \times P) \times T_{CSI-RS})$
DRX ≤ 320ms	Max(200, Ceil(1.5×M <sub>out</sub> ×P)×	Max(100, Ceil(1.5×M <sub>in</sub> ×P)× Max(T <sub>DRX</sub> , T <sub>CSI</sub> -
	Max(T <sub>DRX</sub> , T <sub>CSI-RS</sub> ))	RS))
DRX > 320ms	DRX > 320ms $Ceil(M_{out} \times P) \times T_{DRX}$ $Ceil(M_{in} \times P) \times T_{DRX}$	
NOTE: T <sub>CSI-RS</sub> is the periodicity of the CSI-RS resource configured for RLM. The requirements in this table		
apply for Tosues e	gual to 5 ms, 10ms, 20 ms or 40 ms, Top	x is the DRX cycle length

Table 8.1.3.2-2: Evaluation period T<sub>Evaluate\_out\_CSI-RS</sub> and T<sub>Evaluate\_in\_CSI-RS</sub> for FR2

	Configuration	TEvaluate_out_CSI-RS (ms)	T <sub>Evaluate_in_</sub> CSI-RS (ms)
	no DRX	Max(200, Ceil(M <sub>out</sub> ×P×N)×T <sub>CSI-RS</sub> )	Max(100, Ceil(M <sub>in</sub> ×P×N) × T <sub>CSI-RS</sub> )
	DRX ≤ 320ms	Max(200, Ceil(1.5×Mout×P×N)×	Max(100, Ceil(1.5×M <sub>in</sub> ×P×N)×
		Max(T <sub>DRX</sub> , T <sub>CSI-RS</sub> ))	Max(T <sub>DRX</sub> , T <sub>CSI-RS</sub> ))
	DRX > 320ms	Ceil(M <sub>out</sub> ×P×N) × T <sub>DRX</sub>	$Ceil(M_{in} \times P \times N) \times T_{DRX}$
NOTE:	T <sub>CSI-RS</sub> is the periodicity of the CS	SI-RS resource configured for RLM. The	e requirements in this table apply for
	T <sub>CSI-RS</sub> equal to 5 ms, 10 ms, 20 i	ms or 40 ms. TDRX is the DRX cycle len	gth.

#### 8.1.3.3 Measurement restrictions for CSI-RS based RLM

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

For both FR1 and FR2, when the CSI-RS for RLM is in the same OFDM symbol as SSB for RLM, BFD, CBD or L1-RSRP measurement, UE is not required to receive CSI-RS for RLM in the PRBs that overlap with an SSB.

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

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

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

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

For FR2, when the CSI-RS for RLM is in the same OFDM symbol as SSB for RLM, BFD, or L1-RSRP measurement, or in the same symbol as SSB for CBD when beam failure is detected, UE is required to measure one of but not both CSI-RS for RLM and SSB. Longer measurement period for CSI-RS based RLM is expected, and no requirements are defined.

For FR2, when the CSI-RS for RLM is in the same OFDM symbol as another CSI-RS for RLM, BFD, CBD or L1-RSRP measurement.

- In the following cases, UE is required to measure one of but not both CSI-RS for RLM and the other CSI-RS. Longer measurement period for CSI-RS based RLM is expected, and no requirements are defined.
  - The CSI-RS for RLM or the other CSI-RS in a resource set configured with repetition ON, or
  - The other CSI-RS is configured in q1 and beam failure is detected, or
  - The two CSI-RS-es are not QCL-ed w.r.t. QCL-TypeD, or the QCL information is not known to UE,
- Otherwise, UE shall be able to measure the CSI-RS for RLM without any restriction.

## 8.1.4 Minimum requirement at transitions

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

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

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

## 8.1.5 Minimum requirement for UE turning off the transmitter

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

## 8.1.6 Minimum requirement for L1 indication

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

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

The out-of-sync and in-sync evaluations for the configured RLM-RS resources shall be performed as specified in clause 5 in TS 38.213 [3]. Two successive indications from layer 1 shall be separated by at least T<sub>Indication\_interval</sub>.

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

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

# 8.1.7 Scheduling availability of UE during radio link monitoring

When the reference signal to be measured for RLM has different subcarrier spacing than PDSCH/PDCCH or is on frequency range 2, there are restrictions on the scheduling availability as described in the following clauses.

# 8.1.7.1 Scheduling availability of UE performing radio link monitoring with a same subcarrier spacing as PDSCH/PDCCH on FR1

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

# 8.1.7.2 Scheduling availability of UE performing radio link monitoring with a different subcarrier spacing than PDSCH/PDCCH on FR1

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

- The UE is not expected to transmit PUCCH, PUSCH or SRS or receive PDCCH, PDSCH or CSI-RS for tracking or CSI-RS for CQI on SSB symbols to be measured for radio link monitoring.

When intra-band carrier aggregation in FR1 is performed, the scheduling restrictions on FR1 serving PCell or PSCell applies to all serving cells in the same band on the symbols that fully or partially overlap with the restricted symbols. When inter-band carrier aggregation within FR1 is performed, there are no scheduling restrictions on FR1 serving cell(s) in the bands due to radio link monitoring performed on FR1 serving PCell or PSCell in different bands.

## 8.1.7.3 Scheduling availability of UE performing radio link monitoring on FR2

The following scheduling restriction applies due to radio link monitoring on an FR2 serving PCell and/or PSCell.

- If the RLM-RS is CSI-RS which is type-D QCLed with active TCI state for PDCCH or PDSCH, and the CSI-RS is not in a CSI-RS resource set with repetition ON,
  - There are no scheduling restrictions due to radio link monitoring based on the CSI-RS.
- Otherwise
  - The UE is not expected to transmit PUCCH, PUSCH or SRS or receive PDCCH, PDSCH or CSI-RS for tracking or CSI-RS for CQI on RLM-RS symbols to be measured for radio link monitoring.

When intra-band carrier aggregation in FR2 is performed, the scheduling restrictions on FR2 serving PCell or PSCell applies to all serving cells in the same band on the symbols that fully or partially overlap with restricted symbols.

For FR2, if following conditions are met,

- UE has been notified about system information update through paging,
- The gap between UE's reception of PDCCH that UE monitors in the Type2-PDCCH CSS set and that notifies system information update, and the PDCCH that UE monitors in the Type0-PDCCH CSS set, is greater than 2 slots.

For the SSB for RLM and CORESET for RMSI scheduling multiplexing patterns 3, UE is expected to receive the PDCCH that UE monitors in the Type0-PDCCH CSS set, and the corresponding PDSCH, on SSB symbols to be measured for RLM; and

For the SSB for RLM and CORESET for RMSI scheduling multiplexing patterns 2, UE is expected to receive PDSCH that corresponds to the PDCCH that UE monitors in the Type0-PDCCH CSS set, on SSB symbols to be measured for RLM.

# 8.1.7.4 Scheduling availability of UE performing radio link monitoring on FR1 or FR2 in case of FR1-FR2 inter-band CA and NR-DC

There are no scheduling restrictions on FR1 serving cell(s) due to radio link monitoring performed on FR2 serving PCell and/or PSCell.

There are no scheduling restrictions on FR2 serving cell(s) due to radio link monitoring performed on FR1 serving PCell and/or PSCell.

Editor's Note: NR-DC in Rel-15 only includes the scenarios where all serving cells in MCG are in FR1 and all serving cells in SCG are in FR2.

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# 8.2 Interruption

## 8.2.1 EN-DC Interruption

#### 8.2.1.1 Introduction

This clause contains the requirements related to the interruptions on PSCell, and SCell, when

E-UTRA PCell transitions between active and non-active during DRX, or

E-UTRA PCell transitions from non-DRX to DRX, or

E-UTRA SCell in MCG or SCell in SCG is added or released, or

E-UTRA SCell in MCG or SCell in SCG is activated or deactivated, or

measurements on SCC with deactivated SCell in either E-UTRA MCG or NR SCG, or

a supplementary UL carrier or an UL carrier is configured or de-configured, or

UL/DL BWP is switched on PSCell or SCell in SCG.

The requirements shall apply for E-UTRA-NR DC with an E-UTRA PCell.

This clause contains interruptions where victim cell is PSCell or SCell belonging to SCG. Requirements for interruptions requirements when the victim cell is E-UTRA PCell or E-UTRA SCell belonging to MCG are specified in TS 36.133 [15].

For a UE which does not support per-FR measurement gaps, interruptions to the PSCell or activated SCG SCells may be caused by EUTRA PCell, EUTRA SCells or SCells on any frequency range. For UE which support per-FR gaps, interruptions to the PSCell or activated SCG SCells may be caused by EUTRA PCell, EUTRA SCells or SCells on the same frequency range as the victim cell.

#### 8.2.1.2 Requirements

## 8.2.1.2.1 Interruptions at transitions between active and non-active during DRX

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

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

11	NR Slot	Interruption length X (slots	
<i>[</i>	length (ms)	Sync	Async
0	1	1	2
1	0.5	1	2
2	0.25	3	
3	0.125	5	

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

#### 8.2.1.2.2 Interruptions at transitions from non-DRX to DRX

Interruption on PSCell and the activated SCell if configured due to E-UTRA PCell transitions from non-DRX to DRX when PSCell or SCell is in non-DRX shall not exceed X slot as defined in table 8.2.1.2.1-1.

When PSCell and the activated SCell are in DRX, no interruption due to E-UTRA PCell transitions from non-DRX to DRX is allowed.

## 8.2.1.2.3 Interruptions at SCell addition/release

The requirements in this clause shall apply for the UE configured with PSCell.

When one E-UTRA SCell in MCG is added or released:

- the UE is allowed an interruption on any active serving cell in SCG:
  - of up to X1 slot, if the active serving cell is not in the same band as any of the E-UTRA SCells being added or released, or
  - of up to max{Y1 slot + T<sub>SMTC\_duration</sub>, 5ms} if the active serving cells are in the same band as any of the E-UTRA SCells being added or released, provided the cell specific reference signals from the active serving cells and the E-UTRA SCells being added or released are available in the same slot, where T<sub>SMTC\_duration</sub> is the longest SMTC duration among all above active serving cells in SCG;

Where X1 and Y1 are specified in Table 8.2.1.2.3-1.

When one SCell in SCG is added or released:

- the UE is allowed an interruption on any active serving cell in SCG:
  - of up to X1 slot, if the active serving cell is not in the same band as any of the SCells being added or released, or
  - of up to Y1 slot + T<sub>SMTC\_duration</sub> if the active serving cells are in the same band as any of the SCells being added or released, provided the cell specific reference signals from the active serving cells and the SCells being added or released are available in the same slot, where, T<sub>SMTC\_duration</sub> is
    - the longest SMTC duration among all above active serving cells in SCG and the SCell being added when one SCell is added;
    - the longest SMTC duration among all above active serving cells in SCG when one SCell is released.

Where X1 and Y1 are specified in Table 8.2.1.2.3-2.

Table 8.2.1.2.3-1: Interruption length X1 and Y1 at E-UTRA SCell addition/Release

μ	NR Slot length		on length X1 ots)	Interruption le	ngth Y1 (slots)
	(ms)	Sync	Async	Sync	Async
0	1	1	2	1	2
1	0.5	2	3	2	3
2	0.25		5	4	5
3	0.125		9	N/A	N/A

Table 8.2.1.2.3-2: Interruption length X1 and Y1 at SCell addition/Release

μ	NR Slot length (ms) of victim cell	Interruption length X1 (slots)		Interruption length Y1 (slots)
0	1	1		1
1	0.5	2		2
2	0.25	Both aggressor cell and victim cell are on FR2	4	4
		Either aggressor cell or victim cell is on FR1	5	
3	0.125	Aggressor cell is on FR2	8	8
		Aggressor cell is on FR1	9	

## 8.2.1.2.4 Interruptions at SCell activation/deactivation

The requirements in this clause shall apply for the UE configured with PSCell and one SCell.

When one E-UTRA SCell in MCG is activated or deactivated:

- the UE is allowed an interruption on any active serving cell in SCG:
  - of up to X2 slot, if the active serving cell is not in the same band as any of the E-UTRA SCells being activated or deactivated, or
  - of up to max {Y2 slot + T<sub>SMTC\_duration</sub>, 5ms} if the active serving cells are in the same band as any of the E-UTRA SCells being activated or deactivated, provided the cell specific reference signals from the active serving cells and the E-UTRA SCells being activated or deactivated are available in the same slot, where T<sub>SMTC</sub> duration is the longest SMTC duration among all above active serving cells in SCG.

Where X2 and Y2 are specified in Table 8.2.1.2.4-1.

When one SCell in SCG is activated or deactivated:

- an interruption on any serving cell in SCG:
  - of up to X2 slot, if the active serving cell is not in the same band as any of the SCells being activated or deactivated, or
  - of up to Y2 slot +  $T_{SMTC\_duration}$  if the active serving cells are in the same band as any of the SCells being activated or deactivated, provided the cell specific reference signals from the active serving cells and the SCells being activated or deactivated are available in the same slot, where,  $T_{SMTC\_duration}$  is
    - the longest SMTC duration among all above active serving cells in SCG and the SCell being activated when one SCell is activated;
    - the longest SMTC duration among all above active serving cells in SCG when one SCell is deactivated.

Where X2 and Y2 are specified in Table 8.2.1.2.4-2.

Table 8.2.1.2.4-1: Interruption length X2 and Y2 at E-UTRA SCell activation/deactivation

μ	NR Slot length		on length X2 ots)	Interruption le	ngth Y2 (slots)
	(ms)	Sync	Async	Sync	Async
0	1	1	2	1	2
1	0.5	1	2	1	2
2	0.25		3	2	3
3	0.125		5	N/A	N/A

Table 8.2.1.2.4-2: Interruption length X2 and Y2 at SCell activation/deactivation

μ	NR Slot length (ms) of victim cell	Interruption length X2 (slots)		Interruption length Y2 (slots)
0	1	1		1
1	0.5	1		1
2	0.25	Both aggressor cell and victim cell are on FR2	2	2
		Either aggressor cell or victim cell is on FR1	3	
3	0.125	Aggressor cell is on FR2	4	4
		Aggressor cell is on FR1	5	

## 8.2.1.2.5 Interruptions during measurements on SCC

#### 8.2.1.2.5.1 Interruptions during measurements on deactivated NR SCC

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

#### 8.2.1.2.5.2 Interruptions during measurements on deactivated E-UTRAN SCC

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

- an interruption on PSCell or any activated SCell with up to 0.5% probability of missed ACK/NACK when any of the configured *measCycleSCell* [15] for the deactivated E-UTRA SCells is 640 ms or longer.
- an interruption on PSCell or any activated SCell with up to 0.5% probability of missed ACK/NACK regardless of the configured *measCycleSCell* [15] for the deactivated E-UTRA SCells if indicated by the network using IE *allowInterruptions* [15].

Each interruption shall not exceed

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

Table 8.2.1.2.5.2-1: Interruption length X3 and Y3 at measurements on deactivated E-UTRA SCC

μ	NR Slot length	Interruption length X3 (slots)		Interruption length Y3 (slots)	
	(ms)	Sync	Async	Sync	Async
0	1	1	2	1	2
1	0.5	1	2	1	2
2	0.25		3	2	3
3	0.125		5	N/A	N/A

#### 8.2.1.2.6 Interruptions at UL carrier RRC reconfiguration

The requirements in this clause shall apply when a supplementary UL carrier or an UL carrier is configured or deconfigured in NR non-standalone operation as defined in TS 38.331 [2].

When an UL carrier or supplementary UL carrier is configured or de-configured, an interruption of up to X4 slot, is allowed during the RRC reconfiguration procedure [2] on E-UTRA PCell, all activated E-UTRA SCells, PSCell and all activated SCells within the same FR as the reconfigured uplink carrier. The interruption is for both uplink and downlink of E-UTRA PCell, all activated E-UTRA SCells, PSCell and all activated SCells within the same FR as the configured or de-configured UL.

Table 8.2.1.2.6-1: Interruption length X4 at UL carrier RRC reconfiguration

$\mu$	NR Slot length (ms)	Interruption length X4 (slots)	
		Sync	Async
0	1	1	2
1	0.5	2	3
2	0.25	5	
3	0.125	9	

## 8.2.1.2.7 Interruptions due to Active BWP switching Requirement

The requirements for DCI-based and timer-based BWP switches in this clause only apply to the case that the BWP switch is performed on a single CC.

When UE receives a DCI indicating UE to switch its active BWP involving changes in any of the parameters listed in Table 8.2.1.2.7-2, the UE is allowed to cause interruption of up to X slot to other active serving cells if the UE is not capable of per-FR gap, or if the BWP switching involves SCS changing. When the BWP switch imposes changes in any of the parameters listed in Table 8.2.1.2.7-2 and the UE is capable of per-FR gap, the UE is allowed to cause interruption of up to X slot to other active serving cells in the same frequency range wherein the UE is performing BWP switching. X is defined in Table 8.2.1.2.7-1. The starting time of interruption is only allowed within the BWP switching delay  $T_{\rm BWPswitchDelay}$  as defined in clause 8.6.2. Interruptions are not allowed during BWP switch involving other parameter change.

When a BWP timer *bwp-InactivityTimer* defined in TS 38.331 [2] expires, UE is allowed to cause interruption of up to X slot to other active serving cells due to switching its active BWP involving changes in any of the parameters listed in Table 8.2.1.2.7-2 if the UE is not capable of per-FR gap, or if the BWP switching involves SCS changing. When the BWP switch imposes changes in any of the parameters listed in Table 8.2.1.2.7-2 and the UE is capable of per-FR gap, the UE is allowed to cause interruption of up to X slot to other active serving cells in the same frequency range wherein the UE is performing BWP switching. X is defined in Table 8.2.1.2.7-1. The starting time of interruption is only allowed within the BWP switching delay T<sub>BWPswitchDelay</sub> as defined in clause 8.6.2. Interruptions are not allowed during BWP switch involving other parameter change.

When UE receives an RRC reconfiguration that only requests UE to switch its active BWP on one single CC, the UE is allowed to cause interruption of up to X slot to other active serving cells due to switching its active BWP involving changes in any of the parameters listed in Table 8.2.1.2.7-2 if the UE is not capable of per-FR gap, or if the BWP switching involves SCS changing. When the BWP switch imposes changes in any of the parameters listed in Table 8.2.1.2.7-2 and the UE is capable of per-FR gap, the UE is allowed to cause interruption of up to X slot to other active serving cells in the same frequency range wherein the UE is performing BWP switching. X is defined in Table 8.2.1.2.7-1. The interruption is only allowed within the delay  $T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}$  defined in clause 8.6.3.

Table 8.2.1.2.7-1: interruption length X

,, NR Slot Interruption length X

$\mu$	NR Slot length (ms)	Interruption length X (slots <sup>Note 1</sup> )	
0	1	1	
1	0.5	1	
2	0.25	3	
3	0.125	5	
Note1:	If the BWP switch involves changing of SCS, the interruption due to BWP switch is determined by the smaller SCS between the SCS before BWP switch and the SCS after the BWP switch.		

Table 8.2.1.2.7-2: Parameters which cause interruption other than SCS

Parameters	Comment
locationAndBandwidth	From TS 38.331 [2]
nrofSRS-Ports	F1011 13 36.331 [2]
Editor's note: More parameters can be added if identified	

# 8.2.2 SA: Interruptions with Standalone NR Carrier Aggregation

#### 8.2.2.1 Introduction

This clause contains the requirements related to the interruptions on PCell and activated SCell if configured, when

up to 7 SCells are configured, de-configured, activated or deactivated, or

a supplementary UL carrier or an UL carrier is configured or de-configured, or

measurements on SCC with deactivated SCell in NR SCG, or

UL/DL BWP is switched on PCell or SCell.

Note: interruptions at SCell addition/release, activation/deactivation and during measurements on SCC may not be required by all UEs.

Editor's Note: The interruptions shall not interrupt RRC signalling or ACK/NACKs related to RRC reconfiguration procedure [2] for SCell addition/release or MAC control signalling [17] for SCell activation/deactivation command.

This clause additionally contains requirements related to interruptions at inter-frequency SFTD between PCell in FR1 and neighbour cell in FR2.

For a UE which does not support per-FR measurement gaps, interruptions to the PCell and activated SCell may be caused by SCells on any frequency range. For UE which support per-FR gaps, interruptions to PCell and activated SCell may be caused by SCells on the same frequency range as the victim cell.

## 8.2.2.2 Requirements

## 8.2.2.2.1 Interruptions at SCell addition/release

When any number of SCells between one and 7 is added or released using the same *RRCConnectionReconfiguration* message as defined in TS 38.331 [2], the UE is allowed an interruption on any active serving cell during the RRC reconfiguration procedure as follows:

- an interruption on any active serving cell:
  - of up to the duration shown in table 8.2.2.2.1-1, if the active serving cell is not in the same band as any of the SCells being added or released, or
  - of up to the duration shown in table 8.2.2.2.1-2, if the active serving cells are in the same band as any of the SCells being added or released, provided the cell specific reference signals from the active serving cells and the SCells being added or released are available in the same slot.

Table 8.2.2.2.1-1: Interruption duration for SCell addition/release for inter-band CA

μ	NR Slot length (ms) of victim cell	Interruption length (slots)			
0	1	1			
1	0.5	2			
2	0.25	Both aggressor cell and victim cell are on FR2	4		
		Either aggressor cell or victim cell is on FR1	5		
3	0.125	Aggressor cell is on FR2	8		
		Aggressor cell is on FR1	9		

Table 8.2.2.2.1-2: Interruption duration for SCell addition/release for intra-band CA

μ	NR Slot length (ms)	Interruption length (slot)
0	1	1 + T <sub>SMTC_duration</sub> * $N_{\rm slot}^{\rm subframe, \mu}$
1	0.5	2 + T <sub>SMTC_duration</sub> * $N_{\text{slot}}^{\text{subframe},\mu}$
2	0.25	4 + T <sub>SMTC_duration</sub> * $N_{\rm slot}^{\rm subframe, \mu}$
3	0.125	8 + T <sub>SMTC_duration</sub> * $N_{\rm slot}^{\rm subframe}$ , $\mu$
NOTE 1: T <sub>SMTC_duration</sub> measured in subframes is - the longest SMTC duration among all above active serving cells and the SCell being added when one SCell is added; - the longest SMTC duration among all active serving cells in the same band when one SCell is released.		
NOTE	2: N <sub>slot</sub>	<sup>,μ</sup> is as defined in TS 38.211 [6].

## 8.2.2.2.2 Interruptions at SCell activation/deactivation

When an intra-band SCell is activated or deactivated as defined in TS 37.340 [17], the UE is allowed

- an interruption on any active serving cell:
  - of up to the duration shown in table 8.2.2.2.2-1, if the active serving cell is not in the same band as any of the SCells being activated or deactivated, or
  - of up to the duration shown in table 8.2.2.2.2-2, if the active serving cells are in the same band as any of the SCells being activated or deactivated provided the cell specific reference signals from the active serving cells and the SCells being activated or deactivated are available in the same slot.

Table 8.2.2.2.1: Interruption duration for SCell activation/deactivation for inter-band CA

μ	NR Slot length (ms) of victim cell	Interruption length (slots)	
0	1		1
1	0.5		1
2	0.25	Both aggressor cell and victim cell are on FR2	2
		Either aggressor cell or victim cell is on FR1	3
3	0.125	Aggressor cell is on FR2	4
		Aggressor cell is on FR1	5

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

μ	NR Slot length (ms)	Interruption length (slots)		
0	1	1 + T <sub>SMTC_duration</sub> * $N_{\rm slot}^{\rm subframe, \mu}$		
1	0.5	1 + $T_{SMTC\_duration} * N_{slot}^{subframe,\mu}$		
2	0.25 $2 + T_{SMTC\_duration} * N_{slot}^{subframe}$			
3	3 0.125 $4 + T_{SMTC\_duration} * N_{slot}^{subframe}$			
NOTE 1: T <sub>SMTC_duration</sub> measured in subframes is - the longest SMTC duration among all above active serving cells and the SCell being activated when one SCell is activated; - the longest SMTC duration among all active serving cells in the same band when one SCell is deactivated.				
NOTE 2:	$N_{ m slot}^{ m subframe,\mu}$ is as de	fined in TS 38.211 [6].		

## 8.2.2.2.3 Interruptions during measurements on deactivated SCC

Interruptions on PCell due to measurements when an SCell is deactivated are allowed with up to 0.5% probability of missed ACK/NACK when the configured *measCycleSCell* [2] is 640 ms or longer. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption shall not exceed requirement in Table 8.2.2.2.1 if the PCell is not in the same band as the deactivated SCell. Each interruption shall not exceed requirement in Table 8.2.2.2.2.2 if the PCell is in the same band as the deactivated SCell.

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

## 8.2.2.2.4 Interruptions at UL carrier RRC reconfiguration

The requirements in this clause shall apply when a supplementary UL carrier or an UL carrier is configured or deconfigured in NR standalone carrier aggregation as defined in TS 38.331 [2].

When an UL carrier or supplementary UL carrier is configured or de-configured, an interruption of up to the duration shown in table 8.2.2.2.4-1, is allowed during the RRC reconfiguration procedure [2] on PCell and all activated SCells within the same FR as the reconfigured uplink carrier. The interruption is for both uplink and downlink of PCell and all the activated SCells within the same FR as the configured or de-configured UL.

Table 8.2.2.2.4-1: Interruption duration for UL carrier RRC reconfiguration

μ	NR Slot length (ms)	Interruption length (slots)
0	1	1
1	0.5	2
2	0.25	4
3	0.125	8

#### 8.2.2.2.5 Interruptions due to Active BWP switching Requirement

The requirements for DCI-based and timer-based BWP switches in this clause only apply to the case that the BWP switch is performed on a single CC.

When UE receives a DCI indicating UE to switch its active BWP involving changes in any of the parameters listed in Table 8.2.2.2.5-2, the UE is allowed to cause interruption of up to X slot to other active serving cells if the UE is not

capable of per-FR gap, or if the BWP switching involves SCS changing. When the BWP switch imposes changes in any of the parameters listed in Table 8.2.2.2.5-2 and the UE is capable of per-FR gap the UE is allowed to cause interruption of up to X slot to other active serving cells in the same frequency range wherein the UE is performing BWP switching. X is defined in Table 8.2.2.2.5-1. The starting time of interruption is only allowed within the BWP switching delay  $T_{BWPswitchDelay}$  as defined in clause 8.6.2. Interruptions are not allowed during BWP switch involving other parameter change.

When a BWP timer *bwp-InactivityTimer* defined in TS 38.331 [2] expires, UE is allowed to cause interruption of up to X slot to other active serving cells due to switching its active BWP involving changes in any of the parameters listed in Table 8.2.2.2.5-2 if the UE is not capable of per-FR gap, or if the BWP switching involves SCS changing. When the BWP switch imposes changes in any of the parameters listed in Table 8.2.2.2.5-2 and the UE is capable of per-FR gap, the UE is allowed to cause interruption of up to X slot to other active serving cells in the same frequency range wherein the UE is performing BWP switching. X is defined in Table 8.2.2.2.5-1. The starting time of interruption is only allowed within the BWP switching delay T<sub>BWPswitchDelay</sub> as defined in clause 8.6.2. Interruptions are not allowed during BWP switch involving other parameter change.

When UE receives an RRC reconfiguration that only requests UE to switch its active BWP on one single CC, the UE is allowed to cause interruption of up to X slot to other active serving cells due to switching its active BWP involving changes in any of the parameters listed in Table 8.2.2.2.5-2 if the UE is not capable of per-FR gap, or if the BWP switching involves SCS changing. When the BWP switch imposes changes in any of the parameters listed in Table 8.2.2.2.5-2 and the UE is capable of per-FR gap, the UE is allowed to cause interruption of up to X slot to other active serving cells in the same frequency range wherein the UE is performing BWP switching. X is defined in Table 8.2.2.2.5-1. The interruption is only allowed within the delay  $T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}$  defined in clause 8.6.3.

 μ
 NR Slot length (ms)
 Interruption length X (slotsNote 1)

 0
 1
 1

 1
 0.5
 1

 2
 0.25
 3

 3
 0.125
 5

 Note1:
 If the BWP switch involves changing of SCS,

Table 8.2.2.2.5-1: Interruption length X

the interruption due to BWP switch is determined by the smaller SCS between the SCS before BWP switch and the SCS after the BWP switch

Table 8.2.2.2.5-2: Parameters which cause interruption other than SCS

Parameters	Comment	
locationAndBandwidth	From TS 38.331 [2]	
nrofSRS-Ports		
Editor's note: More parameters can be added if identified		

## 8.2.2.2.6 Interruptions at inter-frequency SFTD measurement

The requirements in this clause concern interruptions on PCell, as well as on activated SCells in MCG, when the UE is performing SFTD measurements on inter-frequency neighbour cell(s). The following requirements apply when no PSCell is configured.

For a UE with per-FR gap capability:

- for neighbour cell in FR1:
  - the percentage of interrupted slots on uplink and downlink on FR1 serving cells during the SFTD measurement period T<sub>measure\_SFTD1</sub> specified in Clause 9.3.8 shall not exceed the percentages specified in Table 8.2.2.2.6-1. No interruption is allowed on FR2 serving cells.

- the length of each interruption on FR1 serving cells shall not exceed the number of slots specified in Table 8.2.2.2.6-2.
- for neighbour cell in FR2:
  - the percentage of interrupted slots on uplink and downlink on FR2 serving cells during the SFTD measurement period T<sub>measure\_SFTD1</sub> specified in Clause 9.3.8 shall not exceed the percentages specified in Table 8.2.2.2.6-1. No interruption is allowed on FR1 serving cells.
  - the length of each interruption on FR2 serving cells shall not exceed the number of slots specified in Table 8.2.2.2.6-2.

For a UE with per-UE gap capability:

- for neighbour cell in FR1 or FR2:
  - the percentage of interrupted slots on uplink and downlink on FR1 and FR2 serving cells during the SFTD measurement period T<sub>measure\_SFTD1</sub> specified in Clause 9.3.8 shall not exceed the percentages specified in Table 8.2.2.2.6-1.
  - the length of each interruption on FR1 and FR2 serving cells shall not exceed the number of slots specified in Table 8.2.2.2.6-2.

Table 8.2.2.2.6-1: Requirements on maximum percentage of interrupted slots in serving cell in interfrequency SFTD

SFTD	Serving	Neighbour cell SMTC periodicity					
configuration	<b>cell</b> µ	5ms	10ms	20ms	40ms	80ms	160ms
With RSRP	0						
report	1	ro 40/1	re 20/1	ro 40/1	IC 20/1	IE 20/1	r4 <del>7</del> 0/1
	2	[8.4%]	[6.3%]	[8.4%]	[6.3%]	[5.3%]	[4.7%]
	3						
Without RSRP	0	[11.4%]	[8.6%]	[7.9%]	[6.8%]	[6.3%]	[6.0%]
report	1						
	2						
	3						

Table 8.2.2.2.6-2: Interruption duration for FR1 serving cell in inter-frequency SFTD with neighbour cell in FR1

μ	NR Slot length (ms)	Interruption length (slots)	
0	1	[1]	
1	0.5	[2]	
2	0.25	[4]	
3	0.125	[8]	

Table 8.2.2.2.6-3: Void

Table 8.2.2.2.6-4: Void

# 8.2.3 NE-DC Interruptions

## 8.2.3.1 Introduction

This clause contains the requirements related to the interruptions on PCell and SCell, when

E-UTRA PSCell transitions between active and non-active during DRX, or

E-UTRA PSCell transitions from non-DRX to DRX, or

E-UTRA PSCell/SCell in SCG or SCell in MCG is added or released, or

E-UTRA PSCell/SCell in SCG or SCell in MCG is activated or deactivated, or

measurements on SCC with deactivated SCell in either E-UTRA SCG or NR MCG or

PUSCH/PUCCH carrier configuration and deconfiguration in NR MCG, or

UL/DL BWP is switched on PCell or SCell in MCG.

The requirements shall apply for NE-DC with an NR PCell.

This clause contains interruptions where victim cell is PCell or SCell belonging to MCG. Requirements for interruptions requirements when the victim cell is E-UTRA PSCell or E-UTRA SCell belonging to SCG are specified in TS 36.133 [15].

For a UE which does not support per-FR measurement gaps, interruptions to the PCell, E-UTRA PSCell or activated MCG SCells may be caused by EUTRA PSCell, EUTRA SCells or SCells on any frequency range. For UE which support per-FR gaps, interruptions to the PCell, E-UTRA PSCell or activated MCG SCells may be caused by EUTRA PSCell, EUTRA SCells or SCells on the same frequency range as the victim cell.

## 8.2.3.2 Requirements

### 8.2.3.2.1 Interruptions at transitions between active and non-active during DRX

Interruption on PCell and the activated SCell if configured due to E-UTRA PSCell transitions between active and non-active druing DRX when PCell or SCell is in non-DRX are allowed with up to 1% probability of missed ACK/NACK when the configured E-UTRA PSCell DRX cycle is less than 640 ms, and 0.625% probability of missed ACK/NACK is allowed when the configured E-UTRA PCell DRX cycle is 640 ms or longer. Each interruption shall not exceed X slot as defined in table 8.2.3.2.1-1.

Table 8.2.3.2.1-1: Interruption length X at transition between active and non-active during DRX

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

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

## 8.2.3.2.2 Interruptions at transitions from non-DRX to DRX

Interruption on PCell and the activated SCell if configured due to E-UTRA PSCell transitions from non-DRX to DRX when PCell or SCell is in non-DRX shall not exceed X slot as defined in table 8.2.3.2.1-1.

#### 8.2.3.2.3 Interruptions at PSCell/SCell addition/release

The requirements in this clause shall apply for the UE configured with E-UTRA PSCell.

When one E-UTRA PSCell/SCell in SCG is added or released:

- the UE is allowed an interruption on any active serving cell in MCG:
  - of up to X1 slot, if the active serving cell is not in the same band as any of the E-UTRA PSCell/SCells being added or released, or
  - of up to max {Y1 slot + T<sub>SMTC\_duration</sub>, 5ms} if the active serving cells are in the same band as any of the E-UTRA PSCell/SCells being added or released, provided the cell specific reference signals from the active serving cells and the E-UTRA PSCell/SCells being added or released are available in the same slot, where T<sub>SMTC\_duration</sub> is the longest SMTC duration among all above activated serving cells in MCG;

Where X1 and Y1 are specified in Table 8.2.3.2.3-1.

When one SCell in MCG is added or released:

- the UE is allowed an interruption on any activated serving cell in MCG:
  - of up to X1 slot, if the active serving cell is not in the same band as any of the SCells being added or released, or
  - of up to Y1 slot + T<sub>SMTC\_duration</sub> if the active serving cells are in the same band as any of the SCells being added or released, provided the cell specific reference signals from the active serving cells and the SCells being added or released are available in the same slot, where, T<sub>SMTC\_duration</sub> is
    - the longest SMTC duration among all above active serving cells in MCG and the SCell being added when one SCell is added;
    - the longest SMTC duration among all above active serving cells in MCG when one SCell is released.

Where X1 and Y1 are specified in Table 8.2.3.2.3-2.

Table 8.2.3.2.3-1: Interruption length X1 and Y1 at E-UTRA PSCell/SCell addition/release

μ	NR Slot length		n length X1 ots)	Interruption le	ngth Y1 (slots)
	(ms)	Sync	Async	Sync	Async
0	1	1	2	1	2
1	0.5	2	3	2	3
2	0.25		5	4	5
3	0.125	9	9	N/A	N/A

Table 8.2.3.2.3-2: Interruption length X1 and Y1 at SCell addition/Release

μ	NR Slot length (ms) of victim cell	Interruption length X1 (s	slots)	Interruption length Y1 (slots)
0	1	1		1
1	0.5	2		2
2	0.25	Both aggressor cell and victim cell are on FR2	4	4
		Either aggressor cell or victim cell is on FR1	5	
3	0.125	Aggressor cell is on FR2	8	8
		Aggressor cell is on FR1	9	

### 8.2.3.2.4 Interruptions at SCell activation/deactivation

The requirements in this clause shall apply for the UE configured with E-UTRA PSCell and one SCell.

When one E-UTRA SCell in SCG is activated or deactivated:

- the UE is allowed an interruption on any active serving cell in MCG:
  - of up to X2 slot, if the active serving cell is not in the same band as any of the E-UTRA SCells being activated or deactivated, or
  - of up to max  $\{Y2 \text{ slot} + T_{SMTC\_duration}, 5ms\}$  if the active serving cells are in the same band as any of the E-UTRA SCells being activated or deactivated, provided the cell specific reference signals from the active serving cells and the E-UTRA SCells being activated or deactivated are available in the same slot, where  $T_{SMTC\_duration}$  is the longest SMTC duration among all above active serving cells in MCG.

Where X2 and Y2 are specified in Table 8.2.3.2.4-1.

When one SCell in MCG is activated or deactivated:

- the UE is allowed an interruption on any serving cell in MCG:
  - of up to X2 slot, if the active serving cell is not in the same band as any of the SCells being activated or deactivated, or
  - of up to Y2 slot +  $T_{SMTC\_duration}$  if the active serving cells are in the same band as any of the SCells being activated or deactivated, provided the cell specific reference signals from the active serving cells and the SCells being activated or deactivated are available in the same slot, where,  $T_{SMTC\_duration}$  is
    - the longest SMTC duration among all above active serving cells in MCG and the SCell being activated when one SCell is activated;
    - the longest SMTC duration among all above active serving cells in MCG when one SCell is deactivated.

Where X2 and Y2 are specified in Table 8.2.3.2.4-2.

Table 8.2.3.2.4-1: Interruption length X2 and Y2 at E-UTRA SCell activation/deactivation

μ	NR Slot length		n length X2 ots)	Interruption le	ngth Y2 (slots)
	(ms)	Sync	Async	Sync	Async
0	1	1	2	1	2
1	0.5	1	2	1	2
2	0.25		3	2	3
3	0.125		5	N/A	N/A

Table 8.2.3.2.4-2: Interruption length X2 and Y2 at SCell activation/deactivation

μ	NR Slot length (ms) of victim cell	Interruption leng	Interruption length Y2 (slots)	
0	1	1	1	
1	0.5	1		1
2	0.25	Both aggressor cell and victim cell are on FR2	2	2
		Either aggressor cell or 3 victim cell is on FR1		
3	0.125	Aggressor cell is on FR2	4	4
		Aggressor cell is on FR1	5	

### 8.2.3.2.5 Interruptions during measurements on SCC

### 8.2.3.2.5.1 Interruptions during measurements on deactivated NR SCC

Interruption on PCell and other activated SCell(s) during measurement on the deactivated NR SCC shall meet requirements in clause 8.2.2.2.3.

### 8.2.3.2.5.2 Interruptions during measurements on deactivated E-UTRAN SCC

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

- an interruption on PCell or any activated SCell with up to 0.5% probability of missed ACK/NACK when any of the configured *measCycleSCell* [15] for the deactivated E-UTRA SCells is 640 ms or longer.
- an interruption on PCell or any activated SCell with up to 0.5% probability of missed ACK/NACK regardless of the configured *measCycleSCell* [15] for the deactivated E-UTRA SCells if indicated by the network using IE *allowInterruptions* [15].

Each interruption shall not exceed

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

Where X3 and Y3 are specified in Table 8.2.3.2.5-1

Table 8.2.3.2.5-1: Interruption length X3 and Y3 at measurements on deactivated E-UTRA SCC

μ	NR Slot length	-	n length X3 ots)	Interruption le	ength Y3 (slot)
	(ms)	Sync	Async	Sync	Async
0	1	1	2	1	2
1	0.5	1	2	1	2
2	0.25	;	3	2	3
3	0.125		5	N/A	N/A

### 8.2.3.2.6 Interruptions at UL carrier RRC reconfiguration

The requirements in this clause shall apply when a supplementary UL carrier or an UL carrier is configured or deconfigured in NE-DC.

When an UL carrier or supplementary UL carrier is configured or deconfigured, an interruption of up to X4 slot as specified in Table 8.2.3.2.6-1, is allowed during the RRC reconfiguration procedure [2] on PCell, all activated SCells within the same FR as the reconfigured uplink carrier. The interruption is for both uplink and downlink of PCell, all activated E-UTRA SCells, E-UTRA PSCell and all activated SCells within the same FR as the configured or deconfigured UL.

Table 8.2.3.2.6-1: Interruption length X4 at UL carrier RRC reconfiguration

μ	NR Slot length (ms)	Interruption length X4 (slots)		
	-	Sync	Async	
0	1	1	2	
1	0.5	2 3		
2	0.25	5		
3	0.125	9		

### 8.2.3.2.7 Interruptions due to Active BWP switching Requirement

The requirements for DCI-based and timer-based BWP switches in this clause only apply to the case that the BWP switch is performed on a single CC.

When UE receives a DCI indicating the UE to switch its active BWP, or when a BWP timer *bwp-InactivityTimer* defined in TS 38.331 [2] expires, or when the UE receives an RRC command indicating the UE to switch its active BWP, the UE is allowed an interruption on PCell and any activated SCells as defined in clause 8.2.2.2.5.

### 8.2.4 NR-DC: Interruptions

### 8.2.4.1 Introduction

This clause contains the requirements related to the interruptions on PCell, PSCell and activated SCell if configured, when

up to TBD SCells are configured, de-configured, activated or deactivated or,

a supplementary UL carrier or an UL carrier is configured or de-configured, or

measurements on SCC with deactivated SCell in NR SCG, or

UL/DL BWP is switched on PCell, PSCell or SCell.transitions between active and non-active during DRX, or transitions from non-DRX to DRX.

Note: interruptions at SCell addition/release, activation/deactivation and during measurements on SCC may not be required by all UEs.

Editor's Note: The interruptions shall not interrupt RRC signalling or ACK/NACKs related to RRC reconfiguration procedure [2] for SCell addition/release or MAC control signalling [17] for SCell activation/deactivation command. How to specify this is FFS.

The requirements shall apply for NR-DC with an NR PCell, PSCell or SCell.

For a UE which does not support per-FR measurement gaps, interruptions to the PCell and activated SCell may be caused by SCells on any frequency range. For UE which support per-FR gaps, interruptions to PCell, PSCell and activated SCell may be caused by SCells on the same frequency range as the victim cell.

### 8.2.4.2 Requirements

### 8.2.4.2.1 Interruptions at PSCell/SCell addition/release

When PSCell or any number of SCells between one and TBD is added or released using the same *RRCConnectionReconfiguration* message as defined in TS 38.331 [2], the UE is allowed an interruption on any activated serving cell during the RRC reconfiguration procedure as follows:

- an interruption on any active serving cell:
  - of up to the duration shown in table 8.2.4.2.1-1, if the active serving cell is not in the same band as any of the SCells being added or released, or
  - of up to the duration shown in table 8.2.4.2.1-2, if the active serving cells are in the same band as any of the SCells being added or released, provided the cell specific reference signals from the active serving cells and the SCells being added or released are available in the same slot.

Table 8.2.4.2.1-1: Interruption duration for PSCell/SCell addition/release for inter-band DC/CA

μ	NR Slot length (ms) of victim cell	Interruptio	n length (slots)			
0	1	1				
1	0.5	2				
2	0.25	Both aggressor cell and victim cell are on FR2	4			
		Either aggressor cell or 5 victim cell is on FR1				
3	0.125	Aggressor cell is on FR2	8			
		Aggressor cell is on FR1	9			

Table 8.2.4.2.1-2: Interruption duration for SCell addition/release for intra-band DC/CA

μ	NR Slot length (ms)	Interruption length (slots)
0	1	1 + T <sub>SMTC_duration</sub> * $N_{ m slot}^{ m subframe}$ , $\mu$
1	0.5	2 + $T_{SMTC\_duration} * N_{slot}^{subframe,\mu}$
2	0.25	4 + T <sub>SMTC_duration</sub> * $N_{\rm slot}^{\rm subframe}$ , $\mu$
3	0.125	8 + T <sub>SMTC_duration</sub> * $N_{\rm slot}^{\rm subframe, \mu}$
- the long above ac being ad - the long active se		ration measured in subframes is gest SMTC duration among all ctiveserving cells and the SCell Ided when one SCell is added; gest SMTC duration among all erving cells in the same band when sell is released.
NOTE	2: N <sub>slot</sub>	<sup>µ</sup> is as defined in TS 38.211 [6].

### 8.2.4.2.2 Interruptions at SCell activation/deactivation

When a SCell is activated or deactivated as defined in TS 37.340 [17], the UE is allowed

- an interruption on any active serving cell:
  - of up to the duration shown in table 8.2.4.2.2-1, if the active serving cell is not in the same band as any of the SCells being activated or deactivated, or
  - of up to the duration shown in table 8.2.4.2.2-2, if the active serving cells are in the same band as any of the SCells being activated or deactivated provided the cell specific reference signals from the active serving cells and the SCells being activated or deactivated are available in the same slot.

Table 8.2.4.2.2-1: Interruption duration for SCell activation/deactivation for inter-band DC/CA

μ	NR Slot length (ms) of victim cell	Interruption length (slots)			
0	1	1			
1	0.5	1			
2	0.25	Both aggressor cell and 2 victim cell are on FR2			
		Either aggressor cell or 3 victim cell is on FR1			
3	0.125	Aggressor cell is on FR2	4		
		Aggressor cell is on FR1	5		

Table 8.2.4.2.2-2: Interruption duration for SCell activation/deactivation for intra-band DC/CA

$\mu$	NR Slot	Interruption length (slots)				
,	length (ms)					
0	1	1 + T <sub>SMTC_duration</sub> * $N_{\rm slot}^{\rm subframe, \mu}$				
1	0.5	1 + T <sub>SMTC_duration</sub> * $N_{\rm slot}^{\rm subframe, \mu}$				
2	0.25	2 + T <sub>SMTC_duration</sub> * $N_{\text{slot}}^{\text{subframe},\mu}$				
3	0.125	4 + $T_{SMTC\_duration} * N_{slot}^{subframe,\mu}$				
NOTE 1:	NOTE 1: T <sub>SMTC_duration</sub> measured in subframes is					
		C duration among all above				
	active serving cell	s and the SCell being activated				
	when one SCell is	•				
	- the longest SMTC duration among all active					
serving cells in the same band when one SCell is						
	deactivated.					
NOTE 2: $N_{\text{olet}}^{\text{subframe},\mu}$ is as defined in TS 38.211 [6].						

### 8.2.4.2.3 Interruptions during measurements on SCC

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

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

### 8.2.4.2.4 Interruptions at UL carrier RRC reconfiguration

The requirements in this clause shall apply when a supplementary UL carrier or an UL carrier is configured or deconfigured in NR-DC as defined in TS 38.331 [2].

When an UL carrier or supplementary UL carrier is configured or de-configured, an interruption of up to the duration shown in table 8.2.4.2.4-1, is allowed during the RRC reconfiguration procedure [2] on all the other activated serving cells within the same FR as the reconfigured uplink carrier. The interruption is for both uplink and downlink of all the other serving cells within the same FR as the configured or de-configured UL.

Table 8.2.4.2.4-1: Interruption duration for UL carrier RRC reconfiguration

μ	NR Slot length (ms)	Interruption length (slots)
0	1	1
1	0.5	2
2	0.25	4
3	0.125	8

### 8.2.4.2.5 Interruptions due to Active BWP switching Requirement

The requirements for DCI-based and timer-based BWP switches in this clause only apply to the case that the BWP switch is performed on a single CC.

When UE receives a DCI indicating the UE to switch its active BWP, or when a BWP timer bwp-InactivityTimer defined in TS 38.331 [2] expires, or when the UE receives an RRC command indicating the UE to switch its active BWP, the UE is allowed to cause an interruption on any other serving cells as defined in clause 8.2.2.2.5.

#### 8.2.4.2.6 Interruptions at transitions between active and non-active during DRX

When PCell is in non-DRX and PSCell is in DRX, interruptions on PCell and the activated SCell in MCG if configured due to transitions from active to non-active and from non-active to active during PSCell DRX are allowed with up to 1% probability of missed ACK/NACK when the configured PSCell DRX cycle is less than 640 ms, and 0.625% probability of missed ACK/NACK is allowed when the configured PSCell DRX cycle is 640 ms or longer. Each interruption shall not exceed X slot as defined in table 8.2.4.2.6-1.

When PSCell is in non-DRX and PCell is in DRX, interruptions on PSCell on the activated SCell in SCG if configured due to transitions from active to non-active and from non-active to active during PCell DRX are allowed with up to 1 % probability of missed ACK/NACK when the configured PCell DRX cycle is less than 640 ms, and 0.625% probability of missed ACK/NACK is allowed when the configured PCell DRX cycle is 640 ms or longer. Each interruption shall not exceed X slot as defined in table 8.2.4.2.6-1.

Table 8.2.4.2.6-1: Interruption length X at transition between active and non-active during DRX

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

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

#### 8.2.4.2.7 Interruptions at transitions from non-DRX to DRX

Interruption on PCell and the activated SCell in MCG if configured due to PSCell transitions from non-DRX to DRX when PCell is in non-DRX shall not exceed X slot as defined in table 8.2.4.2.6-1.

Interruption on PSCell and the activated SCell in SCG if configured due to PCell transitions from non-DRX to DRX when PSCell is in non-DRX shall not exceed X slot as defined in table 8.2.4.2.6-1.

#### 8.3 SCell Activation and Deactivation Delay

#### 8.3.1 Introduction

This clause defines requirements for the delay within which the UE shall be able to activate a deactivated SCell and deactivate an activated SCell in EN-DC, or in standalone NR carrier aggregation, or in NE-DC, or in NR-DC.

The requirements shall apply for EN-DC, standalone NR carrier aggregation, NE-DC, and NR-DC.

#### 8.3.2 SCell Activation Delay Requirement for Deactivated SCell

The requirements in this clause shall apply for the UE configured with one downlink SCell in EN-DC, or in standalone NR carrier aggregation or in NE-DC or in NR-DC and when one SCell is being activated.

The delay within which the UE shall be able to activate the deactivated SCell depends upon the specified conditions.

Upon receiving SCell activation command in slot n, the UE shall be capable to transmit valid CSI report and apply actions related to the activation command for the SCell being activated no later than in slot n +  $T_{HARQ+T_{activation\_time}+T_{CSI\_Reporting}}$ , where:

NR slot length

T<sub>HARO</sub> (in ms) is the timing between DL data transmission and acknowledgement as specified in TS 38.213 [3]

T<sub>activation time</sub> is the SCell activation delay in millisecond.

If the SCell is known and belongs to FR1, Tactivation time is:

- T<sub>FirstSSB</sub>+ 5ms, if the SCell measurement cycle is equal to or smaller than 160ms.

-  $T_{FirstSSB\ MAX} + T_{rs} + 5ms$ , if the SCell measurement cycle is larger than 160ms.

If the SCell is unknown and belongs to FR1, provided that the side condition  $\hat{E}s/Iot \ge [-2]dB$  is fulfilled,  $T_{activation time}$  is:

-  $T_{FirstSSB MAX} + T_{SMTC MAX} + 2*T_{rs} + 5ms$  provided

If the SCell being activated belongs to FR2 and if there is at least one active serving cell on that FR2 band, then  $T_{activation time}$  is  $T_{FirstSSB}$ + 5ms provided:

- The UE is provided with SMTC for the target SCell, and
- The SSBs in the serving cell(s) and the SSBs in the SCell fulfil the condition defined in clause 3.6.3.

If the SCell being activated belongs to FR2 and if there is at least one active serving cell on that FR2 band, if the UE is not provided with any SMTC for the target SCell, T<sub>activation time</sub> is 3 ms, provided

- the RS (s) of SCell being activated is (are) QCL-TypeD with RS (s) of one active serving cell on that FR2 band.

If the SCell being activated belongs to FR2 and if there is no active serving cell on that FR2 band provided that PCell or PSCell is FR1:

If the target SCell is known to UE and semi-persistent CSI-RS is used for CSI reporting, then Tactivation time is:

- T<sub>FineTiming</sub> + 5ms, if UE receives the SCell activation command, semi-persistent CSI-RS activation command and TCI state activation command at the same time.
- Tuncertainty\_MAC +TFineTiming + 5ms, if UE receives TCI state activation command after SCell activation command..

If the target SCell is known to UE and periodic CSI-RS is used for CSI reporting, then Tactivation time is:

- max(T<sub>uncertainty\_MAC</sub> + 5ms + T<sub>FineTiming</sub>, T<sub>uncertainty\_RRC</sub> + T<sub>RRC\_delay</sub>-T<sub>HARQ</sub>), where T<sub>uncertainty\_MAC</sub>=0 if UE receives the SCell activation command and TCI state activation commands at the same time.

If the target SCell is unknown to UE and semi-persistent CSI-RS is used for CSI reporting, provided that the side condition  $\hat{E}$ s/Iot  $\geq$  [-2]dB is fulfilled, then  $T_{activation time}$  is:

If the target SCell is unknown to UE and periodic CSI-RS is used for CSI reporting, provided that the side condition  $\hat{E}$ s/Iot  $\geq$  [-2]dB is fulfilled, then  $T_{activation\_time}$  is:

- 
$$3\text{ms} + 24*T_{rs} + T_{L1\text{-RSRP, measure}} + T_{L1\text{-RSRP, report}} + \text{max } \{(T_{HARQ} + T_{uncertainty\_MAC} + 5\text{ms} + T_{FineTiming}), (T_{uncertainty\_RRC} + T_{RRC\_delay})\}.$$

Where,

 $T_{SMTC\ MAX}$ :

- In FR1, in case of intra-band SCell activation, T<sub>SMTC\_MAX</sub> is the longer SMTC periodicity between active serving cells and SCell being activated provided the cell specific reference signals from the active serving cells and the SCells being activated or released are available in the same slot; in case of inter-band SCell activation, T<sub>SMTC\_MAX</sub> is the SMTC periodicity of SCell being activated.
- In FR2, T<sub>SMTC\_MAX</sub> is the longer SMTC periodicity between active serving cells and SCell being activated provided that in Rel-15 only support FR2 intra-band CA.
- T<sub>SMTC MAX</sub> is bounded to a minimum value of 10ms.

 $T_{rs}$  is the SMTC periodicity of the SCell being activated if the UE has been provided with an SMTC configuration for the SCell in SCell addition message, otherwise  $T_{rs}$  is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement which involves  $T_{rs}$  is applied with  $T_{rs}$ 

= 5ms assuming the SSB transmission periodicity is 5ms. There is no requirements if the SSB transmission periodicity is not 5ms

 $T_{FirstSSB}$ : is the time to first SSB indicated by the SMTC after  $n + T_{HARQ} + 3ms$ 

T<sub>FirstSSB MAX</sub>: Is the time to first SSB indicated by the SMTC after n + T<sub>HARO</sub>+3ms, further fulfilling:

- In FR1, in case of intra-band SCell activation, the occasion when all active serving cells and SCells being activated or released are transmitting SSB bursts in the same slot; in case of inter-band SCell activation, the first occasion when the SCell being activated is transmitting SSB burst.
- In FR2, the occasion when all active serving cells and SCells being activated or released are transmitting SSB bursts in the same slot.

T<sub>FineTiming</sub> is the time period between UE finish processing the last activation command for PDCCH TCI, PDSCH TCI (when applicable) and semi-persistent CSI-RS (when applicable) and the timing of first complete available SSB corresponding to the TCI state.

 $T_{L1\text{-RSRP, measure}}$  is L1-RSRP measurement delay  $T_{L1\text{-RSRP\_Measurement\_Period\_SSB}}$  (ms) or  $T_{L1\text{-RSRP\_Measurement\_Period\_CSI-RS}}$  based on applicability as defined in clause 9.5 assuming M=1.

 $T_{\text{L1-RSRP, report}}$  is delay of acquiring CSI reporting resources.

T<sub>uncertainty\_MAC</sub> is the time period between reception of the last activation command for PDCCH TCI, PDSCH TCI (when applicable) and semi-persistent CSI-RS for CQI reporting (when applicable) relative to

- SCell activation command for known case;
- First valid L1-RSRP reporting for unknown case.

T<sub>uncertainty\_RRC</sub> is the time period between reception of the RRC configuration message for TCI of periodic CSI-RS for CQI reporting (when applicable) relative to

- SCell activation command for known case;
- First valid L1-RSRP reporting for unknown case.

T<sub>RRC</sub> delay is the RRC procedure delay as specified in [2].

T<sub>CSI\_reporting</sub> is the delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting and uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [2].

SCell in FR1 is known if it has been meeting the following conditions:

- During the period equal to max(5 measCycleSCell, 5 DRX cycles) for FR1 before the reception of the SCell activation command:
  - the UE has sent a valid measurement report for the SCell being activated and
  - the SSB measured remains detectable according to the cell identification conditions specified in clause 9.2 and 9.3.
- the SSB measured during the period equal to max(5 measCycleSCell, 5 DRX cycles) also remains detectable during the SCell activation delay according to the cell identification conditions specified in clause 9.2 and 9.3.

Otherwise SCell in FR1 is unknown.

For the first SCell activation in FR2 bands, the SCell is known if it has been meeting the following conditions:

- During the period equal to [4s] for UE supporting power class 1 and [3s] for UE supporting power class 2/3/4 before UE receives the last activation command for PDCCH TCI, PDSCH TCI (when applicable) and semi-persistent CSI-RS for CQI reporting (when applicable):
  - the UE has sent a valid L3-RSRP measurement report with SSB index

- SCell activation command is received after L3-RSRP reporting and no later than the time when UE receives MAC-CE command for TCI activation
- During the period from L3-RSRP reporting to the valid CQI reporting, the reported SSBs with indexes remain detectable according to the cell identification conditions specified in clauses 9.2 and 9.3, and the TCI state is selected based on one of the latest reported SSB indexes.

Otherwise, the first SCell in FR2 band is unknown. The requirement for unknown SCell applies provided that the activation commands for PDCCH TCI, PDSCH TCI (when applicable), semi-persistent CSI-RS for CQI reporting (when applicable), and configuration message for TCI of periodic CSI-RS for CQI reporting (when applicable) are based on the latest valid L1-RSRP reporting.

If the UE has been provided with higher layer in TS 38.331 [2] signaling of *smtc2* prior to the activation command, T<sub>SMTC\_Scell</sub> follows *smtc1* or *smtc2* according to the physical cell ID of the target cell being activated. T<sub>SMTC\_MAX</sub> follows *smtc1* or *smtc2* according to the physical cell IDs of the target cells being activated and the active serving cells.

In addition to CSI reporting defined above, UE shall also apply other actions related to the activation command specified in TS 38.331 [2] for a SCell at the first opportunities for the corresponding actions once the SCell is activated.

The interruption on PSCell or any activated SCell in SCG for EN-DC mode specified in clause 8.2 shall not occur before slot  $n+1+\frac{T_{HARQ}}{NR\ slot\ length}$  and not occur after slot  $n+1+\frac{T_{HARQ}+3+T_{SMTC\_MAX}+T_{SMTC\_duration}}{NR\ slot\ length}$ .

The interruption on PCell or any activated SCell in MCG for NR standalone mode specified in clause 8.2 shall not occur before slot  $n+1+\frac{T_{HARQ}}{NR\;slot\;length}$  and not occur after slot  $n+1+\frac{T_{HARQ}+3+T_{SMTC\_MAX}+T_{SMTC\_duration}}{NR\;slot\;length}$ .

Starting from the slot specified in clause 4.3 of TS 38.213 [3] (timing for secondary Cell activation/deactivation) and until the UE has completed the SCell activation, the UE shall report out of range if the UE has available uplink resources to report CQI for the SCell.

Starting from the slot specified in clause 4.3 of TS 38.213 [3] (timing for secondary Cell activation/deactivation) and until the UE has completed a first L1-RSRP measurement, the UE shall report lowest valid L1 SS-RSRP range if the UE has available uplink resources to report L1-RSRP for the SCell.

## 8.3.3 SCell Deactivation Delay Requirement for Activated SCell

The requirements in this clause shall apply for the UE configured with one downlink SCell in EN-DC, or in standalone NR carrier aggregation, or in NE-DC, or in NR-DC.

Upon receiving SCell deactivation command or upon expiry of the sCellDeactivationTimer in slot n, the UE shall accomplish the deactivation actions for the SCell being deactivated no later than in slot  $n + \frac{T_{HARQ} + 3ms}{NR \, slot \, length}$ .

The interruption on PSCell or any activated SCell in SCG for EN-DC mode specified in clause 8.2 shall not occur before slot  $n+1+\left[\frac{T_{HARQ}}{NR\ slot\ length}\right]$  and not occur after slot  $n+1+\frac{T_{HARQ}+3ms}{NR\ slot\ length}$ .

The interruption on PCell or any activated SCell in MCG for NR standalone mode specified in clause 8.2 shall not occur before slot n+1+[ $\frac{T_{HARQ}}{NR \ slot \ length}$ ] and not occur after slot n+1+ $\frac{T_{HARQ}+3ms}{NR \ slot \ length}$ .

## 8.4 UE UL carrier RRC reconfiguration delay

### 8.4.1 Introduction

The requirements in this clause apply for a UE being configured or deconfigured with a supplementary UL carrier or NR UL carrier.

### 8.4.2 UE UL carrier configuration delay requirement

When the UE receives a RRC message implying NR UL or supplementary UL carrier configuration, the UE shall be ready to start transmission on the newly configured carrier within T<sub>UL\_carrier\_config</sub> from the end of the last slot containing the RRC command.

T<sub>UL carrier config</sub> equals the maximum RRC procedure delay defined in clause 12 in TS 38.331 [2].

## 8.4.3 UE UL carrier deconfiguration delay requirement

When the UE receives a RRC message implying NR UL or supplementary UL carrier deconfiguration RRC signalling, the UE shall stop UL signalling on the deconfigured UL carrier within  $T_{UL\_carrier\_deconfig}$  from the end of the last slot containing the RRC command.

 $T_{UL\_carrier\_deconfig}$  equals the maximum RRC procedure delay defined in clause 12 in TS 38.331 [2].

## 8.5 Link Recovery Procedures

### 8.5.1 Introduction

The UE shall assess the downlink radio link quality of a serving cell based on the reference signal in the set  $\bar{q}_0$  as specified in TS 38.213 [3] in order to detect beam failure on:

- PCell in SA, NR-DC, or NE-DC operation mode,
- PSCell in NR-DC and EN-DC operation mode.

The RS resource configurations in the set  $\bar{q}_0$  can be periodic CSI-RS resources and/or SSBs. UE is not required to perform beam failure detection outside the active DL BWP. UE is not required to meet the requirements in clause 8.5.2 and 8.5.3 if UE does not have set  $\bar{q}_0$ .

On each RS resource configuration in the set  $\bar{q}_0$ , the UE shall estimate the radio link quality and compare it to the threshold  $Q_{\text{out LR}}$  for the purpose of accessing downlink radio link quality of the serving cell beams.

The threshold  $Q_{out\_LR}$  is defined as the level at which the downlink radio level link of a given resource configuration on set  $\bar{q}_0$  cannot be reliably received and shall correspond to the BLER<sub>out</sub> = 10% block error rate of a hypothetical PDCCH transmission. For SSB based beam failure detection,  $Q_{out\_LR\_SSB}$  is derived based on the hypothetical PDCCH transmission parameters listed in Table 8.5.2.1-1. For CSI-RS based beam failure detection,  $Q_{out\_LR\_CSI-RS}$  is derived based on the hypothetical PDCCH transmission parameters listed in Table 8.5.3.1-1.

Upon request the UE shall deliver configuration indexes from the set  $\overline{q}_l$  as specified in TS 38.213 [3], to higher layers, and the corresponding L1-RSRP measurement provided that the measured L1-RSRP is equal to or better than the threshold  $Q_{in\_LR}$ , which is indicated by higher layer parameter rsrp-ThresholdSSB. The UE applies the  $Q_{in\_LR}$  threshold to the L1-RSRP measurement obtained from an SSB. The UE applies the  $Q_{in\_LR}$  threshold to the L1-RSRP measurement obtained for a CSI-RS resource after scaling a respective CSI-RS reception power with a value provided by higher layer parameter powerControlOffsetSS. The RS resource configurations in the set  $\overline{q}_l$  can be periodic CSI-RS resources or SSBs or both SSB and CSI-RS resources. UE is not required to perform candidate beam detection outside the active DL BWP.

### 8.5.2 Requirements for SSB based beam failure detection

### 8.5.2.1 Introduction

The requirements in this clause apply for each SSB resource in the set  $\bar{q}_0$  configured for a serving cell, provided that the SSB configured for beam failure detection is actually transmitted within the UE active DL BWP during the entire evaluation period specified in clause 8.5.2.2.

Table 8.5.2.1-1: PDCCH transmission parameters for beam failure instance

Attribute	Value for BLER
DCI format	1-0
Number of control OFDM symbols	2
Aggregation level (CCE)	8
Ratio of hypothetical PDCCH RE energy to average SSS RE energy	0dB
Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	0dB
Bandwidth (PRBs)	24
Sub-carrier spacing (kHz)	Same as the SCS of RMSI CORESET
DMRS precoder granularity	REG bundle size
REG bundle size	6
CP length	Normal
Mapping from REG to CCE	Distributed

### 8.5.2.2 Minimum requirement

UE shall be able to evaluate whether the downlink radio link quality on the configured SSB resource in set  $\bar{q}_0$  estimated over the last  $T_{\text{Evaluate\_BFD\_SSB}}$  ms period becomes worse than the threshold  $Q_{\text{out\_LR\_SSB}}$  within  $T_{\text{Evaluate\_BFD\_SSB}}$  ms period.

The value of T<sub>Evaluate BFD SSB</sub> is defined in Table 8.5.2.2-1 for FR1.

The value of T<sub>Evaluate BFD SSB</sub> is defined in Table 8.5.2.2-2 for FR2 with scaling factor N=8

For FR1,

- $P = \frac{1}{1 \frac{T_{SSB}}{MRGP}}$ , when in the monitored cell there are measurement gaps configured for intra-frequency, interfrequency or inter-RAT measurements, which are overlapping with some but not all occasions of the SSB.
- P = 1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the SSB.

For FR2,

- $P = \frac{1}{1 \frac{T_{SSB}}{T_{SMTCperiod}}}$ , when BFD-RS resource is not overlapped with measurement gap and the BFD-RS resource is partially overlapped with SMTC occasion (T<sub>SSB</sub> < T<sub>SMTCperiod</sub>).
- $P = P_{sharing factor}$ , when the BFD-RS resource is not overlapped with measurement gap and the BFD-RS resource is fully overlapped with SMTC period ( $T_{SSB} = T_{SMTCperiod}$ ).
- $P = \frac{1}{1 \frac{T_{SSB}}{MRGP} \frac{T_{SSB}}{T_{SMTCperiod}}},$  when the BFD-RS resource is partially overlapped with measurement gap and the

BFD-RS resource is partially overlapped with SMTC occasion ( $T_{SSB} \le T_{SMTCperiod}$ ) and SMTC occasion is not overlapped with measurement gap and

-  $T_{SMTCperiod} \neq MGRP$  or

- $T_{SMTCperiod} = MGRP$  and  $T_{SSB} < 0.5 \times T_{SMTCperiod}$
- $P = \frac{P_{sharing\ factor}}{1 \frac{T_{SSB}}{MRGP}}$ , when the BFD-RS resource is partially overlapped with measurement gap and the BFD-RS resource is partially overlapped with SMTC occasion ( $T_{SSB} < T_{SMTCperiod}$ ) and SMTC occasion is not overlapped with measurement gap and  $T_{SMTCperiod} = MGRP$  and  $T_{SSB} = 0.5 \times T_{SMTCperiod}$
- $P = \frac{1}{1 \frac{T_{SSB}}{Min(MRGP, T_{SMTCperiod})}}$ , when the BFD-RS resource is partially overlapped with measurement gap ( $T_{SSB}$  < MGRP) and the BFD-RS resource is partially overlapped with SMTC occasion ( $T_{SSB} < T_{SMTCperiod}$ ) and SMTC
  - occasion is partially or fully overlapped with measurement gap.
- $P = \frac{P_{sharing\ factor}}{1 \frac{T_{SSB}}{MRGP}}$ , when the BFD-RS resource is partially overlapped with measurement gap and the BFD-RS resource is fully overlapped with SMTC occasion ( $T_{SSB} = T_{SMTCperiod}$ ) and SMTC occasion is partially overlapped with measurement gap ( $T_{SMTCperiod} < MGRP$ )
- $P_{\text{sharing factor}} = 1$ 
  - if all of the reference signals configured for BFD outside measurement gap are not fully overlapped by intrafrequency SMTC occasions, or
  - if all of the reference signal configured for BFD outside measurement gap and fully-overlapped by intrafrequency SMTC occasions are not overlapped by with the SSB symbols indicated by SSB-ToMeasure and 1 symbol before each consecutive SSB symbols indicated by SSB-ToMeasure and 1 symbol after each consecutive SSB symbols indicated by SSB-ToMeasure, given that SSB-ToMeasure is configured;
- $P_{\text{sharing factor}} = 3$ , otherwise.

If the high layer in TS 38.331 [2] signaling of smtc2 is configured,  $T_{SMTCperiod}$  corresponds to the value of higher layer parameter smtc2; Otherwise  $T_{SMTCperiod}$  corresponds to the value of higher layer parameter smtc1.

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

Table 8.5.2.2-1: Evaluation period T<sub>Evaluate BFD SSB</sub> for FR1

Configuration	T <sub>Evaluate_BFD_SSB</sub> (ms)		
no DRX	Max(50, Ceil(5 $\times$ P) $\times$ T <sub>SSB</sub> )		
DRX cycle ≤ 320ms	$Max(50, Ceil(7.5 \times P) \times Max(T_{DRX}, T_{SSB}))$		
DRX cycle > 320ms $Ceil(5 \times P) \times T_{DRX}$			
Note: T <sub>SSB</sub> is the periodicity of SSB in the set $\overline{q}_0$ . T <sub>DRX</sub> is the DRX cycle length.			

Table 8.5.2.2-2: Evaluation period T<sub>Evaluate\_BFD\_SSB</sub> for FR2

Configuration	T <sub>Evaluate_BFD_SSB</sub> (ms)		
no DRX	Max(50, Ceil(5 $\times$ P $\times$ N) $\times$ Tssb)		
DRX cycle ≤ 320ms	$Max(50, Ceil(7.5 \times P \times N) \times Max(T_{DRX}, T_{SSB}))$		
DRX cycle > 320ms	$Ceil(5 \times P \times N) \times T_{DRX}$		
Note: T <sub>SSB</sub> is the periodicity of SSB in the set $\overline{q}_0$ . T <sub>DRX</sub> is the DRX cycle length.			

### 8.5.2.3 Measurement restriction for SSB based beam failure detection

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

For FR1, when the SSB for BFD measurement is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD or L1-RSRP measurement,

- If SSB and CSI-RS have same SCS, UE shall be able to measure the SSB for BFD measurement without any restriction;

- If SSB and CSI-RS have different SCS,
  - If UE supports *simultaneousRxDataSSB-DiffNumerology*, UE shall be able to measure the SSB for BFD measurement without any restriction;
  - If UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both SSB for BFD measurement and CSI-RS. Longer measurement period for SSB based BFD measurement is expected, and no requirements are defined.

For FR2, when the SSB for BFD measurement is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD or L1-RSRP measurement, UE is required to measure one of but not both SSB for BFD measurement and CSI-RS. Longer measurement period for SSB based BFD measurement is expected, and no requirements are defined.

### 8.5.3 Requirements for CSI-RS based beam failure detection

### 8.5.3.1 Introduction

The requirements in this clause apply for each CSI-RS resource in the set  $\bar{q}_0$  of resource configurations for a serving cell, provided that the CSI-RS resource(s) in set  $\bar{q}_0$  for beam failure detection are actually transmitted within the UE active DL BWP during the entire evaluation period specified in clause 8.5.3.2. UE is not expected to perform beam failure detection measurements on the CSI-RS configured for BFD if the CSI-RS is not QCL-ed, with QCL-TypeD when applicable, with the RS in the active TCI state of any CORESET configured in the UE active BWP.

Attribute	Value for BLER	
DCI format	1-0	
Number of control OFDM	2	
symbols	2	
Aggregation level (CCE)	8	
Ratio of hypothetical PDCCH		
RE energy to average CSI-RS	0dB	
RE energy		
Ratio of hypothetical PDCCH		
DMRS energy to average	0dB	
CSI-RS RE energy		
Bandwidth (PRBs)	48	
Sub-carrier spacing (kHz)	SCS of the active DL BWP	
DMRS precoder granularity	REG bundle size	
REG bundle size	6	

Normal

Distributed

Table 8.5.3.1-1: PDCCH transmission parameters for beam failure instance

### 8.5.3.2 Minimum requirement

CP length

UE shall be able to evaluate whether the downlink radio link quality on the CSI-RS resource in set  $\bar{q}_0$  estimated over the last  $T_{\text{Evaluate BFD CSI-RS}}$  ms period becomes worse than the threshold  $Q_{\text{out\_LR\_CSI-RS}}$  within  $T_{\text{Evaluate\_BFD\_CSI-RS}}$  ms period.

The value of T<sub>Evaluate BFD CSI-RS</sub> is defined in Table 8.5.3.2-1 for FR1.

Mapping from REG to CCE

The value of T<sub>Evaluate\_BFD\_CSI-RS</sub> is defined in Table 8.5.3.2-2 for FR2 with N=1. The requirements of T<sub>Evaluate\_BFD\_CSI-RS</sub> apply provided that the CSI-RS for BFD is not in a resource set configured with repetition ON. The requirements shall not apply when the CSI-RS resource in the active TCI state of CORESET is the same CSI-RS resource for BFD and the TCI state information of the CSI-RS resource is not given, wherein the TCI state information means QCL Type-D to SSB for L1-RSRP or CSI-RS with repetition ON.

For FR1,

-  $P = \frac{1}{1 - \frac{T_{CSI-RS}}{MRGP}}$ , when in the monitored cell there are measurement gaps configured for intra-frequency, interfrequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS.

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

### For FR2,

- P = 1, when the BFD-RS resource is not overlapped with measurement gap and also not overlapped with SMTC occasion.
- $P = \frac{1}{1 \frac{T_{CSI-RS}}{MRGP}}$ , when the BFD-RS resource is partially overlapped with measurement gap and the BFD-RS resource is not overlapped with SMTC occasion ( $T_{CSI-RS} < MGRP$ )
- $P = \frac{1}{1 \frac{T_{\text{CSI-RS}}}{T_{\text{SMTCperiod}}}}$ , when the BFD-RS resource is not overlapped with measurement gap and the BFD-RS resource is partially overlapped with SMTC occasion ( $T_{\text{CSI-RS}} < T_{\text{SMTCperiod}}$ ).
- $P = P_{\text{sharing factor}}$ , when the BFD-RS resource is not overlapped with measurement gap and the BFD-RS resource is fully overlapped with SMTC occasion ( $T_{\text{CSI-RS}} = T_{\text{SMTCperiod}}$ ).
- $P = \frac{1}{1 \frac{T_{CSI-RS}}{MRGP} \frac{T_{CSI-RS}}{T_{SMTCperiod}}}$ , when the BFD-RS resource is partially overlapped with measurement gap and the

BFD-RS resource is partially overlapped with SMTC occasion ( $T_{CSI-RS} \le T_{SMTCperiod}$ ) and SMTC occasion is not overlapped with measurement gap and

- $T_{SMTCperiod} \neq MGRP$  or
- $T_{SMTCperiod} = MGRP$  and  $T_{CSI-RS} < 0.5 \times T_{SMTCperiod}$
- $P = \frac{P_{sharing\ factor}}{1 \frac{T_{CSI-RS}}{MRGP}}$ , when the BFD-RS resource is partially overlapped with measurement gap and the BFD-RS resource is partially overlapped with SMTC occasion ( $T_{CSI-RS} < T_{SMTCperiod}$ ) and SMTC occasion is not overlapped with measurement gap and  $T_{SMTCperiod} = MGRP$  and  $T_{CSI-RS} = 0.5 \times T_{SMTCperiod}$
- $P = \frac{1}{1 \frac{T_{CSI-RS}}{Min(MRGP,T_{SMTCperiod})}}$ , when the BFD-RS resource is partially overlapped with measurement gap ( $T_{CSI-RS} < \frac{1}{1 \frac{T_{CSI-RS}}{Min(MRGP,T_{SMTCperiod})}}$

MGRP) and the BFD-RS resource is partially overlapped with SMTC occasion ( $T_{CSI-RS} < T_{SMTCperiod}$ ) and SMTC occasion is partially or fully overlapped with measurement gap.

- $P = \frac{P_{sharing\ factor}}{1 \frac{T_{CSI-RS}}{MRGP}}$ , when the BFD-RS resource is partially overlapped with measurement gap and the BFD-RS resource is fully overlapped with SMTC occasion ( $T_{CSI-RS} = T_{SMTCperiod}$ ) and SMTC occasion is partially overlapped with measurement gap ( $T_{SMTCperiod} < MGRP$ )
- $P_{\text{sharing factor}} = 3$ .

If the high layer in TS 38.331 [2] signaling of smtc2 is configured,  $T_{SMTCperiod}$  corresponds to the value of higher layer parameter smtc2; Otherwise  $T_{SMTCperiod}$  corresponds to the value of higher layer parameter smtc1.

Note: The overlap between CSI-RS for BFD and SMTC means that CSI-RS for BFD is within the SMTC window duration.

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

The values of M<sub>BFD</sub> used in Table 8.5.3.2-1 and Table 8.5.3.2-2 are defined as

-  $M_{BFD} = 10$ , if the CSI-RS resource(s) in set  $\overline{q}_0$  used for BFD is transmitted with Density = 3.

Table 8.5.3.2-1: Evaluation period T<sub>Evaluate BFD CSI-RS</sub> for FR1

Configuration	T <sub>Evaluate_BFD_CSI-RS</sub> (ms)			
no DRX	$Max(50, [M_{BFD} \times P] \times T_{CSI-RS})$			
DRX cycle ≤ 320ms	$Max(50, [1.5 \times M_{BFD} \times P] \times Max(T_{DRX}, T_{CSI-RS}))$			
DRX cycle > 320ms	$[M_{BFD} \times P] \times T_{DRX}$			
Note: T <sub>CSI-RS</sub> is the periodicity of CSI-RS resource in the set $\overline{q}_{0}$ . T <sub>DRX</sub> is the				
DRX cycle length.				

Table 8.5.3.2-2: Evaluation period T<sub>Evaluate BFD CSI-RS</sub> for FR2

Configuration	T <sub>Evaluate_BFD_CSI-RS</sub> (ms)			
no DRX	$Max(50, [M_{BFD} \times P \times N] \times T_{CSI-RS})$			
DRX cycle ≤ 320ms	$Max(50, [1.5 \times M_{BFD} \times P \times N] \times Max(T_{DRX}, T_{CSI-RS}))$			
DRX cycle > 320ms	$[M_{BFD} \times P \times N] \times T_{DRX}$			
Note: T <sub>CSI-RS</sub> is the periodicity of CSI-RS resource in the set $\overline{q}_{0}$ . T <sub>DRX</sub> is the				
DRX cycle length.				

### 8.5.3.3 Measurement restrictions for CSI-RS beam failure detection

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

For both FR1 and FR2, when the CSI-RS for BFD measurement is in the same OFDM symbol as SSB for RLM, BFD, CBD or L1-RSRP measurement, UE is not required to receive CSI-RS for BFD measurement in the PRBs that overlap with an SSB.

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

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

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

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

For FR2, when the CSI-RS for BFD measurement is in the same OFDM symbol as SSB for RLM, BFD or L1-RSRP measurement, or in the same symbol as SSB for CBD when beam failure is detected, UE is required to measure one of but not both CSI-RS for BFD measurement and SSB. Longer measurement period for CSI-RS based BFD measurement is expected, and no requirements are defined.

For FR2, when the CSI-RS for BFD measurement is in the same OFDM symbol as another CSI-RS for RLM, BFD, CBD or L1-RSRP measurement,

- In the following cases, UE is required to measure one of but not both CSI-RS for BFD measurement and the
  other CSI-RS. Longer measurement period for CSI-RS based BFD measurement is expected, and no
  requirements are defined.
  - The CSI-RS for BFD measurement or the other CSI-RS in a resource set configured with repetition ON, or
  - The other CSI-RS is configured in set  $\overline{q}_1$  and beam failure is detected, or
  - The two CSI-RS-es are not QCL-ed w.r.t. QCL-TypeD, or the QCL information is not known to UE,

- Otherwise, UE shall be able to measure the CSI-RS for BFD measurement without any restriction.

## 8.5.4 Minimum requirement for L1 indication

When the radio link quality on all the RS resources in set  $\bar{q}_0$  is worse than  $Q_{\text{out\_LR}}$ , layer 1 of the UE shall send a beam failure instance indication to the higher layers. A layer 3 filter may be applied to the beam failure instance indications as specified in TS 38.331 [2].

The beam failure instance evaluation for the RS resources in set  $\bar{q}_0$  shall be performed as specified in clause 6 in TS 38.213 [3]. Two successive indications from layer 1 shall be separated by at least T<sub>Indication interval BFD</sub>.

When DRX is not used,  $T_{Indication\_interval\_BFD}$  is max(2ms,  $T_{SSB-RS,M}$ ) or max(2ms,  $T_{CSI-RS,M}$ ), where  $T_{SSB-RS,M}$  and  $T_{CSI-RS,M}$  is the shortest periodicity of all RS resources in set  $\bar{q}_0$  for the accessed cell, corresponding to either the shortest periodicity of the SSB in the set  $\bar{q}_0$  or CSI-RS resource in the set  $\bar{q}_0$ .

When DRX is used, for SSB based link quality measurement,

- $T_{Indication\ interval\ BFD} = Max(1.5 \times DRX\_cycle\_length, 1.5 \times T_{SSB-RS,M})$ , if DRX\_cycle\_length  $\leq 320$ ms,
- T<sub>Indication interval BFD</sub> = DRX\_cycle\_length, if DRX\_cycle\_length > 320ms.

When DRX is used, for CSI-RS based link quality measurement,

- $T_{Indication\ interval\ BFD} = Max(1.5 \times DRX\_cycle\_length, 1.5 \times T_{CSI-RS,M})$ , if DRX\_cycle\_length  $\leq 320$ ms,
- T<sub>Indication\_interval\_BFD</sub> = DRX\_cycle\_length, if DRX\_cycle\_length > 320ms.

## 8.5.5 Requirements for SSB based candidate beam detection

### 8.5.5.1 Introduction

The requirements in this clause apply for each SSB resource in the set  $\bar{q}_1$  configured for a serving cell, provided that the SSBs configured for candidate beam detection are actually transmitted within UE active DL BWP during the entire evaluation period specified in clause 8.5.5.2.

### 8.5.5.2 Minimum requirement

Upon request the UE shall be able to evaluate whether the L1-RSRP measured on the configured SSB resource in set  $\bar{q}_1$  estimated over the last T<sub>Evaluate\_CBD\_SSB</sub> ms period becomes better than the threshold Q<sub>in\_LR</sub> provided SSB\_RP and SSB Ês/Iot are according to Annex Table B.2.4.1 for a corresponding band.

The UE shall monitor the configured SSB resources using the evaluation period in table 8.5.5.2-1 and 8.5.5.2-2 corresponding to the non-DRX mode, if the configured DRX cycle  $\leq$  320ms.

The value of T<sub>Evaluate CBD SSB</sub> is defined in Table 8.5.5.2-1 for FR1.

The value of T<sub>Evaluate CBD SSB</sub> is defined in Table 8.5.5.2-2 for FR2 with scaling factor N=8.

Where,

For FR1,

- $P = \frac{1}{1 \frac{T_{SSB}}{MRGP}}$ , when in the monitored cell there are measurement gaps configured for intra-frequency, interfrequency or inter-RAT measurements, which are overlapping with some but not all occasions of the SSB,
- P = 1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the SSB.

For FR2,

-  $P = \frac{1}{1 - \frac{T_{SSB}}{T_{SMTCperiod}}}$ , when candidate beam detection RS is not overlapped with measurement gap and candidate

beam detection RS is partially overlapped with SMTC occasion ( $T_{SSB} \le T_{SMTCperiod}$ ).

- P is P<sub>sharing factor</sub>, when candidate beam detection RS is not overlapped with measurement gap and candidate beam detection RS is fully overlapped with SMTC period (T<sub>SSB</sub> = T<sub>SMTCperiod</sub>).
- $P = \frac{1}{1 \frac{T_{SSB}}{MRGP} \frac{T_{SSB}}{T_{SMTCperiod}}}, \text{ when candidate beam detection RS is partially overlapped with measurement gap and}$

candidate beam detection RS is partially overlapped with SMTC occasion ( $T_{SSB} \le T_{SMTCperiod}$ ) and SMTC occasion is not overlapped with measurement gap and

- $T_{SMTCperiod} \neq MGRP$  or
- $T_{SMTCperiod} = MGRP \text{ and } T_{SSB} < 0.5 \times T_{SMTCperiod}$
- $P = \frac{P_{sharing\ factor}}{1 \frac{T_{SSB}}{MRGP}}$ , when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion ( $T_{SSB} < T_{SMTCperiod}$ ) and SMTC occasion is not overlapped with measurement gap and  $T_{SMTCperiod} = MGRP$  and  $T_{SSB} = 0.5 \times T_{SMTCperiod}$
- $P = \frac{1}{1 \frac{T_{SSB}}{Min(MRGP,T_{SMTCperiod})}}$ , when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion ( $T_{SSB} < T_{SMTCperiod}$ ) and SMTC occasion is partially or fully overlapped with measurement gap
- $P = \frac{P_{sharing\ factor}}{1 \frac{T_{SSB}}{MRGP}}$ , when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is fully overlapped with SMTC occasion ( $T_{SSB} = T_{SMTCperiod}$ ) and SMTC occasion is partially overlapped with measurement gap ( $T_{SMTCperiod} < MGRP$ )
- $P_{\text{sharing factor}} = 1$ 
  - if all of the reference signals configured for CBD outside measurement gap are not fully overlapped by intrafrequency SMTC occasions, or
  - if all of the reference signal configured for CBD outside measurement gap and fully-overlapped by intrafrequency SMTC occasions are not overlapped by with the SSB symbols indicated by *SSB-ToMeasure* and 1 symbol before each consecutive SSB symbols indicated by *SSB-ToMeasure*, given that *SSB-ToMeasure* is configured;
- $P_{\text{sharing factor}} = 3$ , otherwise.

Table 8.5.5.2-1: Evaluation period T<sub>Evaluate\_CBD\_SSB</sub> for FR1

Con	Configuration T <sub>Evaluate_CBD_SSB</sub> (ms)			
	RX, DRX cycle 320ms	$Ceil(3 \times P) \times T_{SSB}$		
DRX c	ycle > 320ms	Ceil(3 × P) × T <sub>DRX</sub>		
Note:	T <sub>SSB</sub> is the pe length.	eriodicity of SSB in the set $\ \overline{q}_{\scriptscriptstyle 1}$ . $T_{DRX}$ is the DRX cycle		

Table 8.5.5.2-2: Evaluation period T<sub>Evaluate\_CBD\_SSB</sub> for FR2

Con	figuration	T <sub>Evaluate_CBD_SSB</sub> (ms)	
non-DR	X, DRX cycle	Ceil( $3 \times P \times N$ ) $\times T_{SSB}$	
≤ 320ms		. ,	
DRX cy	ORX cycle > 320ms $Ceil(3 \times P \times N) \times T_{DRX}$		
Note:	$T_{SSB}$ is the periodicity of SSB in the set $\ \overline{q}_{l}$ . $T_{DRX}$ is the DRX cycle		
	length.		

### 8.5.5.3 Measurement restriction for SSB based candidate beam detection

For FR1, when the SSB for CBD measurement is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD or L1-RSRP measurement,

- If SSB and CSI-RS have same SCS, UE shall be able to measure the SSB for CBD measurement without any restrictions;
- If SSB and CSI-RS have different SCS-es,
  - If UE supports *simultaneousRxDataSSB-DiffNumerology*, UE shall be able to measure the SSB for CBD measurement without any restriction;
  - If UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both SSB for CBD measurement and CSI-RS. Longer measurement period for SSB based CBD measurement is expected, and no requirements are defined.

For FR2, when the SSB for CBD measurement is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD or L1-RSRP measurement, UE is required to measure one of but not both SSB for CBD measurement and CSI-RS. Longer measurement period for SSB based CBD measurement is expected, and no requirements are defined.

### 8.5.6 Requirements for CSI-RS based candidate beam detection

### 8.5.6.1 Introduction

The requirements in this clause apply for each CSI-RS resource in the set  $\bar{q}_1$  configured for a serving cell, provided that the CSI-RS resources configured for candidate beam detection are actually transmitted within UE active DL BWP during the entire evaluation period specified in clause 8.5.6.2.

### 8.5.6.2 Minimum requirement

Upon request the UE shall be able to evaluate whether the L1-RSRP measured on the configured CSI-RS resource in set  $\overline{q}_1$  estimated over the last  $T_{\text{Evaluate\_CBD\_CSI-RS}}$  [ms] period becomes better than the threshold  $Q_{\text{in\_LR}}$  within  $T_{\text{Evaluate\_CBD\_CSI-RS}}$  [ms] period provided CSI-RS £s/Iot is according to Annex Table B.2.4.2 for a corresponding band.

The UE shall monitor the configured CSI-RS resources using the evaluation period in table 8.5.6.2-1 and 8.5.6.2-2 corresponding to the non-DRX mode, if the configured DRX cycle  $\leq 320$ ms.

The value of T<sub>Evaluate CBD CSI-RS</sub> is defined in Table 8.5.6.2-1 for FR1.

The value of T<sub>Evaluate CBD CSI-RS</sub> is defined in Table 8.5.6.2-2 for FR2 with scaling factor N=8.

For FR1,

- $P = \frac{1}{1 \frac{T_{CSI-RS}}{MRGP}}$ , when in the monitored cell there are measurement gaps configured for intra-frequency, interfrequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS; and
- P = 1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

### For FR2,

- P = 1, when candidate beam detection RS is not overlapped with measurement gap and also not overlapped with SMTC occasion.
- $P = \frac{1}{1 \frac{T_{CSI-RS}}{MRGP}}$ , when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is not overlapped with SMTC occasion ( $T_{CSI-RS} < MGRP$ )
- $P = \frac{1}{1 \frac{T_{\text{CSI-RS}}}{T_{\text{SMTCperiod}}}}$ , when candidate beam detection RS is not overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion ( $T_{\text{CSI-RS}} < T_{\text{SMTCperiod}}$ ).

- P = 3, when candidate beam detection RS is not overlapped with measurement gap and candidate beam detection RS is fully overlapped with SMTC occasion (T<sub>CSI-RS</sub> = T<sub>SMTCperiod</sub>).
- $P = \frac{1}{1 \frac{T_{CSI-RS}}{MRGP} \frac{T_{CSI-RS}}{T_{SMTCperiod}}}$ , when candidate beam detection RS is partially overlapped with measurement gap

and candidate beam detection RS is partially overlapped with SMTC occasion ( $T_{CSI-RS} < T_{SMTCperiod}$ ) and SMTC occasion is not overlapped with measurement gap and

- $T_{SMTCperiod} \neq MGRP$  or
- $T_{SMTCperiod} = MGRP$  and  $T_{CSI-RS} < 0.5 \times T_{SMTCperiod}$
- $P = \frac{3}{1 \frac{T_{CSI-RS}}{MRGP}}$ , when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion ( $T_{CSI-RS} < T_{SMTCperiod}$ ) and SMTC occasion is not overlapped with measurement gap and  $T_{SMTCperiod} = MGRP$  and  $T_{CSI-RS} = 0.5 \times T_{SMTCperiod}$
- $P = \frac{1}{1 \frac{T_{\text{CSI-RS}}}{Min(MRGP,T_{SMTCperiod})}}$ , when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is partially overlapped with SMTC occasion ( $T_{\text{CSI-RS}} < T_{\text{SMTCperiod}}$ ) and SMTC occasion is partially or fully overlapped with measurement gap
- $P = \frac{3}{1 \frac{T_{CSI-RS}}{MRGP}}$ , when candidate beam detection RS is partially overlapped with measurement gap and candidate beam detection RS is fully overlapped with SMTC occasion ( $T_{CSI-RS} = T_{SMTCperiod}$ ) and SMTC occasion is partially overlapped with measurement gap ( $T_{SMTCperiod} < MGRP$ )

Longer evaluation period would be expected if the CSI-RS is on the same OFDM symbols with RLM, BFD, BM-RS, or other CBD-RS, according to the measurement restrictions defined in clause 8.5.6.3.

The values of M<sub>CBD</sub> used in Table 8.5.6.2-1 and Table 8.5.6.2-2 are defined as

-  $M_{CBD} = 3$ , if the CSI-RS resource configured in the set  $\bar{q}_1$  is transmitted with Density = 3.

Table 8.5.6.2-1: Evaluation period T<sub>Evaluate\_CBD\_CSI-RS</sub> for FR1

Configuration		T <sub>EvaluateC_CBD_CSI-RS</sub> (ms)	
non-DRX, DRX cycle		Max(25, Ceil(M <sub>CBD</sub> $\times$ P) $\times$ T <sub>CSI-RS</sub> )	
≤ 320ms			
DRX cycle > 320ms		$Ceil(M_{CBD} \times P) \times T_{DRX}$	
Note:	$T_{\text{CSI-RS}}$ is the periodicity of CSI-RS resource in the set $\ \overline{q}_1$ . $T_{\text{DRX}}$ is the		
DRX cycle length.			

Table 8.5.6.2-2: Evaluation period T<sub>Evaluate\_CBD\_CSI-RS</sub> for FR2

Configuration		T <sub>Evaluate_CBD_CSI-RS</sub> (ms)	
non-DRX, DRX cycle		Max(25, Ceil( $M_{CBD} \times P \times N$ ) $\times T_{CSI-RS}$ )	
≤ 320ms			
DRX cycle > 320ms		$Ceil(M_{CBD} \times P \times N) \times T_{DRX}$	
Note:	$T_{CSI-RS}$ is the periodicity of CSI-RS resource in the set $\ \overline{q}_1$ . $T_{DRX}$ is the		
DRX cycle length.			

### 8.5.6.3 Measurement restriction for CSI-RS based candidate beam detection

For both FR1 and FR2, when the CSI-RS for CBD measurement is in the same OFDM symbol as SSB for RLM, BFD, CBD or L1-RSRP measurement, UE is not required to receive CSI-RS for CBD measurement in the PRBs that overlap with an SSB.

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

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

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

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

For FR2, when the CSI-RS for CBD measurement is in the same OFDM symbol as SSB for RLM, BFD, CBD or L1-RSRP measurement, UE is required to measure one of but not both CSI-RS for CBD measurement and SSB. Longer evaluation period for CSI-RS based CBD measurement is expected, and no requirements are defined.

For FR2, when the CSI-RS for CBD measurement is in the same OFDM symbol as another CSI-RS for RLM, BFD, CBD or L1-RSRP measurement, UE is required to measure one of but not both CSI-RS for CBD measurement and the other CSI-RS. Longer evaluation period for CSI-RS based CBD measurement is expected, and no requirements are defined.

### 8.5.7 Scheduling availability of UE during beam failure detection

Scheduling availability restrictions when the UE is performing beam failure detection are described in the following clauses.

# 8.5.7.1 Scheduling availability of UE performing beam failure detection with a same subcarrier spacing as PDSCH/PDCCH on FR1

There are no scheduling restrictions due to beam failure detection performed on SSB and CSI-RS configured for BFD with the same SCS as PDSCH or PDCCH in FR1.

# 8.5.7.2 Scheduling availability of UE performing beam failure detection with a different subcarrier spacing than PDSCH/PDCCH on FR1

For UEs which support *simultaneousRxDataSSB-DiffNumerology* [14] there are no restrictions on scheduling availability due to beam failure detection when SSB is configured as BFD. For UEs which do not support *simultaneousRxDataSSB-DiffNumerology* [14] the following restrictions apply due to beam failure detection when SSB is configured as BFD.

- The UE is not expected to transmit PUCCH, PUSCH or SRS or receive PDCCH, PDSCH or CSI-RS for tracking or CSI-RS for CQI on SSB symbols to be measured for beam failure detection.

When intra-band carrier aggregation in FR1 is configured, the scheduling restrictions on FR1 serving PCell or PSCell apply to all serving cells in the same band on the symbols that fully or partially overlap with restricted symbols. When inter-band carrier aggregation within FR1 is configured, there are no scheduling restrictions on FR1 serving cell(s) configured in other bands than the bands in which PCell or PSCell is configured.

### 8.5.7.3 Scheduling availability of UE performing beam failure detection on FR2

The following scheduling restriction applies due to beam failure detection.

- For the case where no RSs are provided for BFD, or when CSI-RS is configured for BFD is explicitly configured and is type-D QCLed with active TCI state for PDCCH or PDSCH, and the CSI-RS is not in a CSI-RS resource set with repetition ON
  - There are no scheduling restrictions due to beam failure detection performed based on the CSI-RS.
- Otherwise

- The UE is not expected to transmit PUCCH, PUSCH or SRS or receive PDCCH, PDSCH or CSI-RS for tracking or CSI-RS for CQI on BFD-RS resource symbols to be measured for beam failure detection.

When intra-band carrier aggregation in FR2 is performed, the scheduling restrictions on FR2 serving PCell or PSCell apply to all serving cells in the same band on the symbols that fully or partially overlap with restricted symbols.

For FR2, if following conditions are met,

- UE has been notified about system information update through paging,
- The gap between UE's reception of PDCCH that UE monitors in the Type2-PDCCH CSS set and that notifies system information update, and the PDCCH that UE monitors in the Type0-PDCCH CSS set, is greater than 2 slots,

For the SSB and CORESET for RMSI scheduling multiplexing patterns 3, UE is expected to receive the PDCCH that UE monitors in the Type0-PDCCH CSS set, and the corresponding PDSCH, on SSB symbols to be measured for BFD mesurement; and

For the SSB and CORESET for RMSI scheduling multiplexing patterns 2, UE is expected to receive PDSCH that corresponds to the PDCCH that UE monitors in the Type0-PDCCH CSS set, on SSB symbols to be measured for BFD measurement.

# 8.5.7.4 Scheduling availability of UE performing beam failure detection on FR1 or FR2 in case of FR1-FR2 inter-band CA and NR DC

There are no scheduling restrictions on FR1 serving cell(s) due to beam failure detection performed on FR2 serving PCell and/or PSCell.

There are no scheduling restrictions on FR2 serving cell(s) due to beam failure detection performed on FR1 serving PCell and/or PSCell.

Editor's Note: NR-DC in Rel-15 only includes the scenarios where all serving cells in MCG are in FR1 and all serving cells in SCG are in FR2.

## 8.5.8 Scheduling availability of UE during candidate beam detection

Scheduling availability restrictions when the UE is performing L1-RSRP measurement for candidate beam detection are described in the following clauses.

# 8.5.8.1 Scheduling availability of UE performing L1-RSRP measurement with a same subcarrier spacing as PDSCH/PDCCH on FR1

There are no scheduling restrictions due to L1-RSRP measurement performed on SSB and CSI-RS configured as link recovery detection resource with the same SCS as PDSCH or PDCCH in FR1.

# 8.5.8.2 Scheduling availability of UE performing L1-RSRP measurement with a different subcarrier spacing than PDSCH/PDCCH on FR1

For UEs which support *simultaneousRxDataSSB-DiffNumerology* [14] there are no restrictions on scheduling availability due to L1-RSRP measurement based on SSB as link recovery detection resource. For UEs which do not support *simultaneousRxDataSSB-DiffNumerology* [14] the following restrictions apply due to L1-RSRP measurement based on SSB configured as link recovery detection resource.

- The UE is not expected to transmit PUCCH, PUSCH or SRS or receive PDCCH, PDSCH, TRS, CSI-RS for tracking or CSI-RS for CQI on SSB symbols to be measured for L1-RSRP.

When intra-band carrier aggregation in FR1 is configured, the scheduling restrictions on one serving cell apply to all other serving cells in the same band on the symbols that fully or partially overlap with the restricted symbols. When inter-band carrier aggregation within FR1 is configured, there are no scheduling restrictions on FR1 serving cell(s) configured in other bands.

### 8.5.8.3 Scheduling availability of UE performing L1-RSRP measurement on FR2

The following scheduling restriction applies due to candidate beam detection

- The UE is not expected to transmit PUCCH, PUSCH or SRS or receive PDCCH, PDSCH, CSI-RS for tracking or CSI-RS for CQI on reference symbols to be measured for candidate beam detection.

When intra-band carrier aggregation in FR2 is configured, the scheduling restrictions on to one serving cell apply to all serving cells in the same band on the symbols that fully or partially overlap with restricted symbols.

For FR2, if following conditions are met,

- UE has been notified about system information update through paging,
- The gap between UE's reception of PDCCH that UE monitors in the Type2-PDCCH CSS set and that notifies system information update, and the PDCCH that UE monitors in the Type0-PDCCH CSS set, is greater than 2 slots,

For the SSB and CORESET for RMSI scheduling multiplexing patterns 3, UE is expected to receive the PDCCH that UE monitors in the Type0-PDCCH CSS set, and the corresponding PDSCH, on SSB symbols to be measured for CBD measurement; and

For the SSB and CORESET for RMSI scheduling multiplexing patterns 2, UE is expected to receive PDSCH that corresponds to the PDCCH that UE monitors in the Type0-PDCCH CSS set, on SSB symbols to be measured for CBD measurement.

# 8.5.8.4 Scheduling availability of UE performing L1-RSRP measurement on FR1 or FR2 in case of FR1-FR2 inter-band CA and NR-DC

There are no scheduling restrictions on FR1 serving cell(s) due to L1-RSRP measurement performed on FR2 serving cell(s).

There are no scheduling restrictions on FR2 serving cell(s) due to L1-RSRP measurement performed on FR1 serving cell(s).

Editor's Note: NR-DC in Rel-15 only includes the scenarios where all serving cells in MCG are in FR1 and all serving cells in SCG are in FR2.

## 8.6 Active BWP switch delay

### 8.6.1 Introduction

The requirements in this clause apply for a UE configured with more than one BWP on PCell or any activated SCell in standalone NR or NE-DC, PCell, PSCell or any activated SCell in MCG or SCG in NR-DC, or PSCell or any activated SCell in SCG in EN-DC. UE shall complete the switch of active DL and/or UL BWP within the delay defined in this clause.

## 8.6.2 DCI and timer based BWP switch delay

The requirements in this clause only apply to the case that the BWP switch is performed on a single CC.

For DCI-based BWP switch, after the UE receives BWP switching request at DL slot n on a serving cell, UE shall be able to receive PDSCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch on the first DL or UL slot occurs right after the beginning of DL slot  $n+T_{BWPswitchDelay}$ .

The UE is not required to transmit UL signals or receive DL signals during time duration T<sub>BWPswitchDelay</sub> on the cell where DCI-based BWP switch occurs. The UE is not required to follow the requirements defined in this clause when performing a DCI-based BWP switch between the BWPs in disjoint channel bandwidths or in partially overlapping channel bandwidths.

For timer-based BWP switch, the UE shall start BWP switch at DL slot n, where n is the beginning of a DL subframe (FR1) or DL half-subframe (FR2) immediately after a BWP-inactivity timer *bwp-InactivityTimer* [2] expires on a serving cell, and the UE shall be able to receive PDSCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch on the first DL or UL slot occurs right after the beginning of DL slot n+ T<sub>BWPswitchDelay</sub>.

The UE is not required to transmit UL signals or receive DL signals after bwp-InactivityTimer [2] expires on the cell where timer-based BWP switch occurs.

Depending on UE capability *bwp-SwitchingDelay* [2], UE shall finish BWP switch within the time duration T<sub>BWPswitchDelay</sub> defined in Table 8.6.2-1.

BWP switch delay TBWPswitchDelay (slots) NR Slot μ length Type 1Note 1 Type 2Note 1 (ms) 0 3 1 0.5 2 5 2 9 0.25 3 0.125 18 3

Table 8.6.2-1: BWP switch delay

Note 1: Depends on UE capability.

Note 2: If the BWP switch involves changing of SCS, the BWP switch delay is determined by the smaller SCS between the SCS before BWP switch and the SCS after BWP switch.

Provided the UE does not have the required TCI-state information to receive PDCCH and PDSCH in the new BWP, the UE shall use old TCI-states before the BWP switch until a new MAC CE updating the required TCI-state information for PDCCH and PDSCH is received after the BWP switch.

If UE has the information on the required TCI-state information to receive PDCCH and PDSCH in the new BWP,

- UE shall be able to receive PDCCH and PDSCH with old TCI-states before the delay as specified in Clause 8.10 in the new BWP.
- UE shall be able to receive PDCCH and PDSCH with new TCI-states after the delay as specified in Clause 8.10 in the new BWP

## 8.6.3 RRC based BWP switch delay

For RRC-based BWP switch, after the UE receives RRC reconfiguration involving active BWP switching or parameter change of its active BWP, UE shall be able to receive PDSCH/PDCCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch occurs on the first DL or UL slot right after the beginning of DL slot  $n + \frac{T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}}{NR Slot length}$ , where

DL slot n is the last slot containing the RRC command, and

 $T_{RRCprocessingDelay}$  is the length of the RRC procedure delay in millisecond as defined in clause 12 in TS 38.331 [2], and

 $T_{BWPswitchDelayRRC} = [6]ms$  is the time used by the UE to perform BWP switch.

The UE is not required to transmit UL signals or receive DL signals during the time defined by  $T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}$  on the cell where RRC-based BWP switch occurs.

### 8.7 Void

## 8.8 NE-DC: E-UTRAN PSCell Addition and Release Delay

### 8.8.1 Introduction

This clause defines requirements for the delay within which the UE shall be able to configure an E-UTRAN PSCell in NR - E-UTRA dual connectivity. The requirements are applicable to an NR - E-UTRA dual connectivity capable UE.

## 8.8.2 E-UTRAN PSCell Addition Delay Requirement

The requirements in this clause shall apply for the UE which is configured with PCell, and may also be configured with one or more SCells.

Upon receiving E-UTRAN PSCell addition in subframe n, the UE shall be capable to transmit PRACH preamble towards E-UTRAN PSCell no later than in subframe  $n + T_{\text{config\_EUTRAN-PSCell}}$ :

Where:

```
T_{config~EUTRAN-PSCell} = 20ms + T_{activation~time} + 50ms + T_{PCell\_DU} + T_{E-UTRAN-PSCell\_DU}
```

 $T_{activation\_time}$  is the E-UTRAN PSCell activation delay. If the E-UTRAN PSCell is known, then  $T_{activation\_time}$  is 20ms. If the E-UTRAN PSCell is unknown, then  $T_{activation\_time}$  is 30ms provided the E-UTRAN PSCell can be successfully detected on the first attempt.

T<sub>PCell\_DU</sub> is the delay uncertainty due to PCell PRACH preamble transmission. T<sub>PCell\_DU</sub> is up to 20ms if E-UTRAN PSCell activation is interrupted by a PCell PRACH preamble transmission, otherwise it is 0.

 $T_{E-UTRAN-PSCell\_DU}$  is the delay uncertainty in acquiring the first available PRACH occasion in the E-UTRAN PSCell.  $T_{E-UTRAN-PSCell\_DU}$  is up to 30ms.

E-UTRAN PSCell is known if it has been meeting the following conditions:

During the last 5 seconds before the reception of the E-UTRAN PSCell configuration command:

- the UE has sent a valid measurement report for the E-UTRAN PSCell being configured and
- the E-UTRAN PSCell being configured remains detectable according to the cell identification conditions specified in clause 8.8 of TS 36.133 [15],
- E-UTRAN PSCell being configured also remains detectable during the E-UTRAN PSCell configuration delay T<sub>config EUTRAN-PSCell</sub>:according to the cell identification conditions specified in clause 8.8 of TS 36.133 [15].

otherwise it is unknown.

The PCell interruption specified in clause 8.2 is allowed only during the RRC reconfiguration procedure [2].

## 8.8.3 E-UTRAN PSCell Release Delay Requirement

The requirements in this clause shall apply for a UE which is configured with PCell and E-UTRAN PSCell, and may also be configured with one or more SCells and/or E-UTRAN SCells.

Upon receiving E-UTRAN PSCell release in subframe n, the UE shall accomplish the release actions specified in TS 38.331 [2] no later than in subframe n+20.

The PCell interruption specified in clause 8.2 is allowed only during the RRC reconfiguration procedure [2].

## 8.9 NR-DC: PSCell Addition and Release Delay

### 8.9.1 Introduction

This clause defines requirements for the delay within which the UE shall be able to configure an PSCell in NR dual connectivity. The requirements are applicable to an NR dual connectivity capable UE.

### 8.9.2 PSCell Addition Delay Requirement

The requirements in this clause shall apply for the UE configured with only PCell in FR1.

Upon receiving PSCell addition in subframe n, the UE shall be capable to transmit PRACH preamble towards PSCell in FR2 no later than in subframe  $n + T_{\text{config PSCell}}$ :

Where:

$$T_{config\ PSCell} = T_{RRC\ delay} + T_{processing} + T_{search} + T_{\Delta} + T_{PSCell\ DU} + 2\ ms$$

T<sub>RRC delay</sub> is the RRC procedure delay as specified in TS 38.331 [2].

 $T_{processing}$  is the SW processing time needed by UE, including RF warm up period.  $T_{processing} = 40$  ms.

 $T_{search}$  is the time for AGC settling and PSS/SSS detection. If the target cell is known,  $T_{search} = 0$  ms. If the target cell is unknown and the target cell  $\hat{E}_s/Iot \ge -2dB$ ,  $T_{search} = 24*$  Trs ms.

 $T_{\Delta}$  is time for fine time tracking and acquiring full timing information of the target cell.  $T_{\Delta} = 1*Trs$  ms for a known or unknown PSCell.

T<sub>PSCell\_DU</sub> is the delay uncertainty in acquiring the first available PRACH occasion in the PSCell. T<sub>PSCell\_DU</sub> is up to the summation of SSB to PRACH occasion associated period and 10 ms. SSB to PRACH occasion associated period is defined in Table 8.1-1 of TS 38.213 [3].

Trs is the SMTC periodicity of the target cell if the UE has been provided with an SMTC configuration for the target cell in PSCell addition message, otherwise Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with Trs = 5 ms assuming the SSB transmission periodicity is 5 ms. There is no requirement if the SSB transmission periodicity is not 5 ms.

In FR1 and FR2, the PSCell is known if it has been meeting the following conditions:

During the last 5 seconds before the reception of the PSCell configuration command:

- the UE has sent a valid measurement report for the PSCell being configured and
- One of the SSBs measured from the PSCell being configured remains detectable according to the cell identification conditions specified in clause 9.3.
- One of the SSBs measured from PSCell being configured also remains detectable during the PSCell
  configuration delay T<sub>config PSCell</sub> according to the cell identification conditions specified in clause 9.3.

otherwise it is unknown.

The PCell interruption specified in clause 8.2 is allowed only during the RRC reconfiguration procedure [2].

## 8.9.3 PSCell Release Delay Requirement

The requirements in this clause shall apply for a UE which is configured with PCell and one PSCell.

Upon receiving PSCell release in subframe n, the UE shall accomplish the release actions specified in TS 38.331 [2] no later than in subframe  $n+T_{RRC\ delay}$ :

Where

T<sub>RRC delay</sub> is the RRC procedure delay as specified in TS 38.331 [2].

The PCell interruption specified in clause 8.2 is allowed only during the RRC reconfiguration procedure [2].

## 8.10 Active TCI state switching delay

### 8.10.1 Introduction

The requirements in this clause apply for a UE configured with one or more TCI state configurations on serving cell in MR-DC or standalone NR. UE shall complete the switch of active TCI state within the delay defined in this clause.

### 8.10.2 Known conditions for TCI state

The TCI state is known if the following conditions are met:

- During the period from the last transmission of the RS resource used for the L1-RSRP measurement reporting
  for the target TCI state to the completion of active TCI state switch, where the RS resource for L1-RSRP
  measurement is the RS in target TCI state or QCLed to the target TCI state
  - TCI state switch command is received within 1280 ms upon the last transmission of the RS resource for beam reporting or measurement
  - The UE has sent at least 1 L1-RSRP report for the target TCI state before the TCI state switch command
  - The TCI state remain detectable during the TCI state switching period
  - The SSB associated with the TCI state remain detectable during the TCI switching period
    - SNR of the TCI state  $\geq$  -3dB

Otherwise, the TCI state is unknown.

## 8.10.3 MAC-CE based TCI state switch delay

If the target TCI state is known, upon receiving PDSCH carrying MAC-CE activation command in slot n, UE shall be able to receive PDCCH with target TCI state of the serving cell on which TCI state switch occurs no later than at slot n+  $T_{\text{HARQ}}$  +(3 ms +TO<sub>k</sub>\*( $T_{\text{first-SSB}}$ +  $T_{\text{SSB-proc}}$ )) / NR slot length. The UE shall be able to receive PDCCH with the old TCI state until slot n+  $T_{\text{HARQ}}$ +(3 ms +TO<sub>k</sub>\*( $T_{\text{first-SSB}}$ )) / NR slot length.

Where T<sub>HARO</sub> is the timing between DL data transmission and acknowledgement as specified in TS 38.321 [7];

T<sub>first-SSB</sub> is time to first SSB transmission after MAC CE command is decoded by the UE;

$$T_{SSB-proc} = 2 \text{ ms};$$

 $TO_k = 1$  if target TCI state is not in the active TCI state list for PDSCH, 0 otherwise.

If the target TCI state is unknown, upon receiving PDSCH carrying MAC-CE activation command in slot n, UE shall be able to receive PDCCH with target TCI state of the serving cell on which TCI state switch occurs no later than at slot n+  $T_{\text{HARQ}}$  +(3 ms +  $T_{\text{L1-RSRP}}$ +TO<sub>uk</sub>\*( $T_{\text{first-SSB}}$ +  $T_{\text{SSB-proc}}$ )) / NR slot length. The UE shall be able to receive PDCCH with the old TCI state until slot n+  $T_{\text{HARQ}}$ +(3 ms+  $T_{\text{L1-RSRP}}$ +TO<sub>uk</sub>\*( $T_{\text{first-SSB}}$ )) / NR slot length.

Where T L1-RSRP is the time for L1-RSRP measurement for Rx beam refinement, defined as

- T<sub>L1-RSRP Measurement Period SSB</sub> for SSB as specified in clause 9.5.4.1,
  - with the assumption of M=1
  - with  $T_{Report} = 0$
- T<sub>L1-RSRP\_Measurement\_Period\_CSI-RS</sub> for CSI-RS as specified in clause 9.5.4.2
  - with the assumption of M=1 for periodic CSI-RS
  - for aperiodic CSI-RS if number of resources in resource set at least equal to MaxNumberRxBeam

- with  $T_{Report} = 0$ 

 $TO_{uk} = 1$  for CSI-RS based L1-RSRP measurement, and 0 for SSB based L1-RSRP measurement when TCI state switching involves QCL-TypeD

 $TO_{uk} = 1$  when TCI state switching involves other QCL types

T<sub>L1-RSRP\_Measurement\_Period\_SSB</sub> = 0 for SSB in FR2 and T<sub>L1-RSRP\_Measurement\_Period\_CSI-RS</sub> = 0 for CSI-RS in FR2, provided that the TCI state switching involves QCL-TypeA, QCL-TypeB or QCL-TypeC only.

T<sub>first-SSB</sub> is time to first SSB transmission after L1-RSRP measurement when TCI state switching involves QCL-TypeD;

T<sub>first-SSB</sub> is time to first SSB transmission after MAC CE command is decoded by the UE for other QCL types;

The SSB shall be the QCL-TypeA or QCL-TypeC to target TCI state

During MAC-CE based TCI state switch the UE is allowed an interruption due to one shot timing adjustment on the serving or any activated serving cells as defined in clause 8.2.

### 8.10.4 DCI based TCI state switch delay

If the target TCI state is known, when a UE is configured with the higher layer parameter *tci-PresentInDCI* which is set as 'enabled' for the CORESET scheduling PDSCH at slot n, UE shall be able to receive PDSCH or transmit PUSCH with target TCI state of the serving cell on which TCI state switch occurs no later than at slot n+*timeDurationForQCL*, where, *timeDurationForQCL* is the time required by the UE to perform PDCCH reception and applying spatial QCL information received in DCI for PDSCH processing as described in TS 38.214 [26], the value of *timeDurationForQCL* is defined in TS 38.306 [14].

The known condition for TCI state defined in clause 8.10.2 is applied.

During DCI based TCI state switch the UE is allowed an interruption due to one shot timing adjustment on the serving or any activated serving cells as defined in clause 8.2.

## 8.10.5 RRC based TCI state switch delay

If the target TCI state is known, upon receiving PDSCH carrying RRC activation command at slot n, UE shall be able to receive PDCCH with target TCI state of the serving cell on which TCI state switch occurs no later than at slot n+  $T_{RRC\_processing} + TO_k*(T_{first-SSB} + T_{SSB-proc}) / NR slot length$ . Where  $T_{RRC\_processing}$  is the RRC processing delay,  $T_{first-SSB}$ ,  $T_{SSB-proc}$  and  $TO_k$  are defined in clause 8.10.3. The UE is not required to receive PDCCH/PDSCH or transmit PUCCH/PUSCH until the end of switching period.

T<sub>first-SSB</sub> is time to first SSB transmission after RRC processing by the UE; The SSB shall be the QCL-TypeA or QCL-TypeC to target TCI state

If the target TCI state is unknown, upon receiving PDSCH carrying RRC activation command at slot n, UE shall be able to receive PDCCH with target TCI state of the serving cell on which TCI state switch occurs no later than at slot n+  $T_{RRC\_processing} + T_{L1-RSRP} + T_{Ouk}*(T_{first-SSB} + T_{SSB-proc}) / NR slot length$ . Where  $T_{RRC\_processing}$  is the RRC processing delay, and  $T_{Ouk}$ ,  $T_{L1-RSRP}$  are defined in clause 8.10.3. The UE is not required to receive PDCCH/PDSCH or transmit PUCCH/PUSCH until the end of switching period.

T<sub>first-SSB</sub> is time to first SSB transmission after L1-RSRP measurement when TCI state switching involves QCL-TypeD;

T<sub>first-SSB</sub> is time to first SSB transmission after RRC processing time at the UE for other QCL types;

The SSB shall be the QCL-TypeA or QCL-TypeC to target TCI state

The requirements for RRC based TCI state switch delay apply when only 1 TCI state is configured in RRC TCI state list.

During RRC based TCI state switch the UE is allowed an interruption due to one shot timing adjustment on the serving or any activated serving cells as defined in clause 8.2.

### 8.10.6 Active TCI state list update delay

If the target TCI state is known, upon receiving PDSCH carrying MAC-CE active TCI state list update at slot n, UE shall be able to receive PDCCH to schedule PDSCH with the new target TCI state no later than slot n+  $T_{HARQ}$  +3ms + $T_{Ok}$ \*( $T_{first-SSB}$ +  $T_{SSB-proc}$ ) / NR slot length. Where  $T_{HARQ}$ ,  $T_{first-SSB}$ ,  $T_{SSB-proc}$  and  $TO_k$  are defined in clause 8.10.3.

## 8.11 PSCell Change

This clause defines requirements for the delay within which the UE shall be able to change PSCell to other SCell in ENDC or NR-DC. The requirements in this clause are applicable to EN-DC and NR-DC. The requirements for PSCell Addition delay in clause 8.9.2 shall apply.

## 9 Measurement Procedure

## 9.1 General measurement requirement

### 9.1.1 Introduction

This clause contains general requirements on the UE regarding measurement reporting in RRC\_CONNECTED state. The requirements are split in intra-frequency, inter-frequency, inter-RAT E-UTRAN FDD, inter-RAT E-UTRAN TDD, and L1-RSRP measurements requirements. These measurements may be used by the NG-RAN. The measurement quantities are defined in TS38.215 [4], the measurement model is defined in TS38.300 [10], TS37.340 [17] and measurement accuracies are specified in clause 10. Control of measurement reporting is specified in TS 36.331 [16].

In the requirements of clause 9, the exceptions for side conditions apply as follows:

- for the UE capable of CA but not configured with any SCell, the applicable exceptions for side conditions are specified in Annex B, clause B.3.2.1 for UE supporting CA in FR1, and clause B.3.2.3 for UE supporting CA in FR2, respectively;
- for the UE capable of CA and configured with at least one SCell, the applicable exceptions for side conditions are specified in Annex B, clause B.3.2.2 for UE configured with CA in FR1, and clause B.3.2.4 for UE supporting CA in FR2, respectively;
- for the UE capable of SUL but not configured with SUL, the applicable exceptions for side conditions are specified in Annex B, clause B.3.4.1 for UE supporting SUL in FR1;
- for the UE capable of SUL and configured with at least one SUL, the applicable exceptions for side conditions are specified in Annex B, clause B.3.4.2 for UE configured with SUL in FR1.

## 9.1.2 Measurement gap

If the UE requires measurement gaps to identify and measure intra-frequency cells and/or inter-frequency cells and/or inter-RAT E-UTRAN cells, and the UE does not support independent measurement gap patterns for different frequency ranges as specified in Table 5.1-1 in [18, 19, 20], in order for the requirements in the following clauses to apply the network must provide a single per-UE measurement gap pattern for concurrent monitoring of all frequency layers.

If the UE requires measurement gaps to identify and measure intra-frequency cells and/or inter-frequency cells and/or inter-RAT E-UTRAN cells, and the UE supports independent measurement gap patterns for different frequency ranges as specified in Table 5.1-1 in [18, 19, 20], in order for the requirements in the following clauses to apply the network must provide either per-FR measurement gap patterns for frequency range where UE requires per-FR measurement gap for concurrent monitoring of all frequency layers of each frequency range independently, or a single per-UE measurement gap pattern for concurrent monitoring of all frequency layers of all frequency ranges.

During the per-UE measurement gaps the UE:

- is not required to conduct reception/transmission from/to the corresponding E-UTRAN PCell, E-UTRAN SCell(s) and NR serving cells for E-UTRA-NR dual connectivity except the reception of signals used for RRM measurement(s) and the signals used for random access procedure according to [7].
- is not required to conduct reception/transmission from/to the corresponding NR serving cells for SA (with single carrier or CA configured) except the reception of signals used for RRM measurement(s) and the signals used for random access procedure according to [7].
- is not required to conduct reception/transmission from/to the corresponding PCell, SCell(s) and E-UTRAN serving cells for NR-E-UTRA dual connectivity except the reception of signals used for RRM measurement(s) and the signals used for random access procedure according to [7].
- is not required to conduct reception/transmission from/to the corresponding NR serving cells for NR-DC except the reception of signals used for RRM measurement(s) and the signals used for random access procedure according to [7].

### During the per-FR measurement gaps the UE:

- is not required to conduct reception/transmission from/to the corresponding E-UTRAN PCell, E-UTRAN SCell(s) and NR serving cells in the corresponding frequency range for E-UTRA-NR dual connectivity except the reception of signals used for RRM measurement(s) and the signals used for random access procedure according to [7].
- is not required to conduct reception/transmission from/to the corresponding NR serving cells in the corresponding frequency range for SA (with single carrier or CA configured) except the reception of signals used for RRM measurement(s) and the signals used for random access procedure according to [7].
- is not required to conduct reception/transmission from/to the corresponding PCell, SCell(s) and E-UTRAN serving cells in the corresponding frequency range for NR-E-UTRA dual connectivity except the reception of signals used for RRM measurement(s) and the signals used for random access procedure according to [7].
- is not required to conduct reception/transmission from/to the corresponding NR serving cells in the corresponding frequency range for NR-DC except the reception of signals used for RRM measurement(s) and the signals used for random access procedure according to [7].

UEs shall support the measurement gap patterns listed in Table 9.1.2-1 based on the applicability specified in table 9.1.2-2 and 9.1.2-3. UE determines measurement gap timing based on gap offset configuration and measurement gap timing advance configuration provided by higher layer signalling as specified in TS 38.331 [2] and TS 36.331 [16].

**Table 9.1.2-1: Gap Pattern Configurations** 

Gap Pattern Id	Measurement Gap Length (MGL, ms)	Measurement Gap Repetition Period (MGRP, ms)
0	6	40
1	6	80
2	3	40
3	3	80
4	6	20
5	6	160
6	4	20
7	4	40
8	4	80
9	4	160
10	3	20
11	3	160
12	5.5	20
13	5.5	40
14	5.5	80
15	5.5	160
16	3.5	20
17	3.5	40
18	3.5	80
19	3.5	160
20	1.5	20
21	1.5	40
22	1.5	80
23	1.5	160

Table 9.1.2-2: Applicability for Gap Pattern Configurations supported by the E-UTRA-NR dual connectivity UE or NR-E-UTRA dual connectivity UE

Measurement gap pattern	Serving cell	Measurement Purpose	Applicable Gap Pattern Id
configuration	F LITDA I FD1 or	non-NR RAT Note1,2	0.1.2.3
Per-UE	E-UTRA + FR1, or E-UTRA + FR2, or	FR1 and/or FR2	0,1,2,3 0-11
measurement	E-UTRA + FR1 +	non-NR RAT <sup>Note1,2</sup>	0, 1, 2, 3, 4, 6, 7, 8,10
gap	FR2	and FR1 and/or	0, 1, 2, 3, 4, 0, 7, 0, 10
yap	TIVE	FR2	
	E-UTRA and, FR1 if configured	non-NR RAT Note1,2	0,1,2,3
	FR2 if configured		No gap
	E-UTRA and, FR1 if configured	FR1 only	0-11
	FR2 if configured		No gap
	E-UTRA and, FR1 if configured	FR2 only	No gap
	FR2 if configured		12-23
Per FR measurement	E-UTRA and, FR1 if configured	non-NR RAT Note1,2 and FR1	0, 1, 2, 3, 4, 6, 7, 8,10
gap	FR2 if configured		No gap
	E-UTRA and, FR1 if configured	FR1 and FR2	0-11
	FR2 if configured		12-23
	E-UTRA and, FR1 if configured	non-NR RAT Note1,2 and FR2	0, 1, 2, 3, 4, 6, 7, 8,10
	FR2 if configured		12-23
	E-UTRA and, FR1 if configured	non-NR RAT Note1,2 and FR1 and FR2	0, 1, 2, 3, 4, 6, 7, 8,10
	FR2 if configured	and the	12-23

Note: In E-UTRA-NR dual connectivity mode, if GSM or UTRA TDD or UTRA FDD inter-RAT frequency layer is configured to be monitored, only measurement gap pattern #0 and #1 can be used for per-FR gap in E-UTRA and FR1 if configured, or for per-UE gap.

NOTE 1: In E-UTRA-NR dual connectivity mode, non-NR RAT includes E-UTRA, UTRA and/or GSM. In NR-E-UTRA dual connectivity mode, non-NR RAT means E-UTRA.

NOTE 2: Void

NOTE 3: When E-UTRA inter-frequency RSTD measurements are configured and the UE requires measurement gaps for performing such measurements, only Gap Pattern #0 can be used.

### In E-UTRA-NR dual connectivity mode,

- if per-UE measurement gap is configured with MG timing advance of T<sub>MG</sub> ms, the measurement gap starts at time T<sub>MG</sub> ms advanced to the end of the latest E-UTRA subframe occurring immediately before the configured measurement gap among MCG serving cells subframes.
- if per-FR measurement gap for FR1 is configured with MG timing advance of T<sub>MG</sub> ms, the measurement gap for FR1 starts at time T<sub>MG</sub> ms advanced to the end of the latest E-UTRA subframe occurring immediately before the configured measurement gap among MCG serving cells subframes.
- if per-FR measurement gap for FR2 is configured with MG timing advance of T<sub>MG</sub> ms, the measurement gap for FR2 starts at time T<sub>MG</sub> ms advanced to the end of the latest NR subframe occurring immediately before the configured measurement gap among SCG serving cells subframes in FR2.

### In NR-E-UTRA dual connectivity mode,

- if per-UE measurement gap is configured with MG timing advance of T<sub>MG</sub> ms, the measurement gap starts at time T<sub>MG</sub> ms advanced to the end of the latest NR subframe occurring immediately before the configured measurement gap among MCG serving cells subframes.
- if per-FR measurement gap for FR1 is configured with MG timing advance of T<sub>MG</sub> ms and UE has NR serving cell in FR1, the measurement gap for FR1 starts at time T<sub>MG</sub> ms advanced to the end of the latest NR subframe occurring immediately before the configured measurement gap among MCG serving cells subframes in FR1.
- if per-FR measurement gap for FR1 is configured with MG timing advance of T<sub>MG</sub> ms and UE doesn't have NR serving cell in FR1, the measurement gap for FR1 starts at time T<sub>MG</sub> ms advanced to the end of the latest E-UTRA subframe occurring immediately before the configured measurement gap among SCG serving cells subframes.
- if per-FR measurement gap for FR2 is configured with MG timing advance of T<sub>MG</sub> ms, the measurement gap for FR2 starts at time T<sub>MG</sub> ms advanced to the end of the latest NR subframe occurring immediately before the configured measurement gap among MCG serving cells subframes in FR2.

### In NR-NR dual connectivity mode,

- If per-UE measurement gap is configured with MG timing advance of T<sub>MG</sub> ms, the measurement gap starts at time T<sub>MG</sub> ms advanced to the end of the latest MCG subframe occurring immediately before the configured measurement gap among MCG serving cells subframes.
- If per-FR measurement gap for FR1 is configured with MG timing advance of T<sub>MG</sub> ms, the measurement gap for FR1 starts at time T<sub>MG</sub> ms advanced to the end of the latest MCG subframe occurring immediately before the configured measurement gap among MCG serving cells subframes.
- If per-FR measurement gap for FR2 is configured with MG timing advance of T<sub>MG</sub> ms, the measurement gap for FR2 starts at time T<sub>MG</sub> ms advanced to the end of the latest SCG subframe occurring immediately before the configured measurement gap among SCG serving cells subframes in FR2.

T<sub>MG</sub> is the MG timing advance value provided in *mgta* according to [2].

In determining the measurement gap starting point, UE shall use the DL timing of the latest E-UTRA or NR subframe occurring immediately before the configured measurement gap among E-UTRA or NR serving cells.

Editor's Note: NR-DC in Rel-15 only includes the scenarios where all serving cells in MCG in FR1 and all serving cells in SCG in FR2.

For per-FR measurement gap capable UE configured with E-UTRA-NR dual connectivity or NR-E-UTRA dual connectivity, when serving cells are in E-UTRA and FR1, measurement objects are in both E-UTRA/FR1 and FR2,

- If MN indicates UE that the measurement gap from MN applies to E-UTRA/FR1/FR2 serving cells, UE fulfils the per-UE measurement requirements for both E-UTRA/FR1 and FR2 measurement objects based on the measurement gap pattern configured by MN;
- If MN indicates UE that the measurement gap from MN applies to only LTE/FR1 serving cell(s),
  - UE fulfils the measurement requirements for FR1/LTE measurement objects based on the configured measurement gap pattern;
  - UE fulfils the requirements for FR2 measurement objects based on effective MGRP=20ms;

For per-FR measurement gap capable configured with E-UTRA-NR dual connectivity, NR-E-UTRA dual connectivity or NR-NR dual connectivity, when serving cells are in E-UTRA, FR1 and FR2, or in E-UTRA and FR2, or in FR1 and FR2, measurement objects are in both E-UTRA /FR1 and FR2,

- If MN indicates UE that the measurement gap from MN applies to E-UTRA/FR1/FR2 serving cells, UE fulfils the per-UE measurement requirements for both E-UTRA/FR1 and FR2 measurement objects based on the measurement gap pattern configured by MN.

Table 9.1.2-3: Applicability for Gap Pattern Configurations supported by the UE with NR standalone operation (with single carrier, NR CA and NR-DC configuration)

Measurement	Serving cell	Measurement	Applicable Gap Pattern Id		
gap pattern		Purpose NOTE 2			
configuration		E LITE A NOTE3	0.4.0.0		
	FR1 <sup>NOTE5</sup> , or FR1 + FR2	E-UTRA only <sup>NOTE3</sup> FR1 and/or FR2	0,1,2,3 0-11		
		E-UTRAN and	0, 1, 2, 3, 4, 6, 7, 8,10		
		FR1 and/or FR2	0, 1, 2, 3, 4, 0, 7, 0, 10		
5		NOTE3			
Per-UE measurement		E-UTRA only NOTE3	0,1,2,3		
gap		FR1 only	0-11		
gap		FR1 and FR2	0-11		
	FR2 NOTE5	E-UTRAN and	0, 1, 2, 3, 4, 6, 7, 8,10		
		FR1 and/or FR2			
			40.00		
	ED4:6 6 1	FR2 only E-UTRA only NOTE3	12-23		
	FR1 if configured	E-UTRA ONLY ***	0,1,2,3		
	FR2 if configured		No gap		
	FR1 if configured	FR1 only	0-11		
	FR2 if configured		No gap		
	FR1 if configured	FR2 only	No gap		
Per FR	FR2 if configured		12-23		
measurement gap	FR1 if configured	E-UTRA and FR1	0, 1, 2, 3, 4, 6, 7, 8,10		
	FR2 if configured	NOTE3	No gap		
	FR1 if configured	FR1 and FR2	0-11		
	FR2 if configured		12-23		
	FR1 if configured	E-UTRA and FR2	0, 1, 2, 3, 4, 6, 7, 8,10		
	FR2 if configured	NOTE3	12-23		
	FR1 if configured	E-UTRA and FR1	0, 1, 2, 3, 4, 6, 7, 8,10		
	FR2 if configured	and FR2 NOTE3	12-23		

- NOTE 1: When E-UTRA inter-RAT RSTD measurements are configured and the UE requires measurement gaps for performing such measurements, only Gap Pattern #0 can be used.
- NOTE 2: Measurement purpose which includes E-UTRA measurements includes also inter-RAT E-UTRA RSRP and RSRQ measurements for E-CID
- NOTE 3: Void

NOTE4: If per-UE measurement gap is configured with MG timing advance of T<sub>MG</sub> ms, the measurement gap starts at time T<sub>MG</sub> ms advanced to the end of the latest subframe occurring immediately before the configured measurement gap among all serving cells subframes. If per-FR measurement gap for FR1 is configured with MG timing advance of T<sub>MG</sub> ms, the measurement gap for FR1 starts at time T<sub>MG</sub> ms advanced to the end of the latest subframe occurring immediately before the configured measurement gap among serving cells subframes in FR1.

If per-FR measurement gap for FR2 is configured with MG timing advance of  $T_{MG}$  ms, the measurement gap for FR2 starts at time  $T_{MG}$  ms advanced to the end of the latest subframe occurring immediately before the configured measurement gap among serving cells subframes in FR2.

 $T_{\rm MG}$  is the MG timing advance value provided in *mgta* according to [2]. In determining the measurement gap starting point, UE shall use the DL timing of the latest subframe occurring immediately before the configured measurement gap among serving cells.

NOTE 5: NR-DC in Rel-15 only includes the scenarios where all serving cells in MCG in FR1 and all serving cells in SCG in FR2.

For per-FR measurement gap capable UE in NR standalone operation (with single carrier, NR CA and NR-DC configuration), for per-FR gap based measurement, when there is no serving cell in a particular FR, where measurement objects are configured, regardless if explicit per-FR measurement gap is configured in this FR, the effective MGRP in this FR is used to determine requirements;

- 20 ms for FR2 NR measurements
- 40 ms for FR1 NR measurements
- 40 ms for LTE measurements
- 40 ms for FR1+LTE measurements

For per-FR measurement gap capable UE in NR standalone operation (with single carrier, NR CA and NR-DC configuration), when serving cells are in FR1 or FR2, measurement objects are in both E-UTRA /FR1 and FR2,

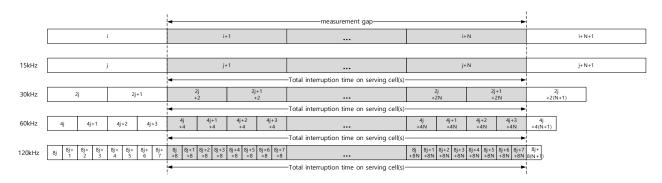
- If MN indicates UE that the measurement gap from MN applies to E-UTRA/FR1/FR2 serving cells, UE fulfils the per-UE measurement requirements for both E-UTRA/FR1 and FR2 measurement objects based on the measurement gap pattern configured by MN;

If measurement gap is configured in one FR but measurement object is not configured in the FR, the scheduling opportunity in the FR depends on the configured measurement gap pattern.

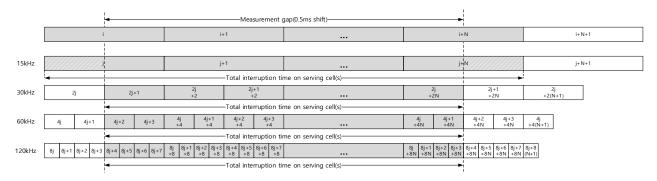
For E-UTRA-NR dual connectivity, if UE is not capable of per-FR-gap, total interruption time on SCG during MGL is defined only when MGL(N) = 6ms, 4ms and 3ms. And if UE is capable of per-FR-gap, total interruption time on FR1 serving cells in SCG during MGL is defined only when MGL(N) = 6ms, 4ms and 3ms, and total interruption time on FR2 serving cells in SCG during MGL is defined only when MGL(N) = 5.5ms, 3.5ms and 1.5ms, given that the reference time for per-FR gap in FR2 is based on an FR2 serving cell.

For NR standalone operation (with single carrier, NR CA and NR-DC configuration), if UE is not capable of per-FR-gap, total interruption time on a serving cell during MGL is defined when MGL(N) = 6ms, 5.5ms, 4ms, 3.5ms, 3ms, and 1.5ms. And if UE is capable of per-FR-gap, total interruption time on FR1 serving cells during MGL is defined only when MGL(N) = 6ms, 4ms and 3ms, and total interruption time on FR2 serving cells during MGL is defined only when MGL(N) = 5.5ms, 3.5ms and 1.5ms, given that the reference time for per-FR gap in FR2 is based on an FR2 serving cell.

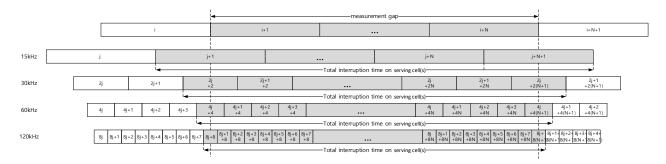
For NR-E-UTRA dual connectivity, if UE is not capable of per-FR-gap, total interruption time on MCG during MGL is defined only when MGL(N) = 6ms, 4ms and 3ms. And if UE is capable of per-FR-gap, total interruption time on FR1 serving cells in MCG during MGL is defined only when MGL(N) = 6ms, 4ms and 3ms, and total interruption time on FR2 serving cells in MCG during MGL is defined only when MGL(N) = 5.5ms, 3.5ms and 1.5ms, given that the reference time for per-FR gap in FR2 is based on an FR2 serving cell.



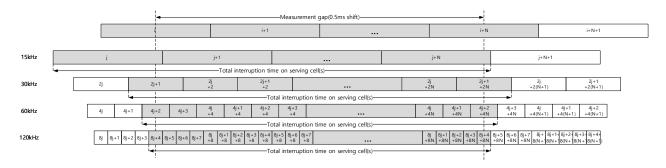
(a) Measurement gap with MGL = N(ms) with MG timing advance of 0ms for synchronous EN-DC, NR standalone operation (with single carrier, NR CA and NR-DC configuration) and synchronous NE-DC



(b) Measurement gap with MGL = N(ms) with MG timing advance of 0.5ms for synchronous EN-DC, NR standalone operation (with single carrier, NR CA and NR-DC configuration) and synchronous NE-DC



(c) Measurement gap with MGL = N(ms) with MG timing advance of 0ms for asynchronous EN-DC and asynchronous NE-DC



(d) Measurement gap with MGL = N(ms) with MG timing advance of 0.5ms for asynchronous EN-DC and asynchronous NE-DC

Figure 9.1.2-1: Measurement GAP and total interruption time on serving cells for EN-DC, NR standalone operation (with single carrier, NR CA and NR-DC configuration) and NE-DC

The corresponding total number of interrupted slots on serving cells is listed in Table 9.1.2-4 for synchronous EN-DC, NR standalone and NE-DC, and in Table 9.1.2-4a for asynchronous EN-DC respectively.

Table 9.1.2-4: Total number of interrupted slots on serving cells during MGL for Synchronous EN-DC, NR standalone operation (with single carrier, NR CA and NR-DC configuration) and NE-DC with per-UE measurement gap or per-FR measurement gap for FR1

NR	Total number of interrupted slots on serving cells					
SCS (kHz)	When MG timing advance of 0ms is applied			When MG timing advance of 0.5ms is applied		
	MGL=6ms	MGL=4ms	MGL=3ms	MGL=6ms	MGL=4ms	MGL=3ms
15	6	4	3	7 <sup>Note3</sup>	5 <sup>Note3</sup>	4 <sup>Note3</sup>
30	12	8	6	12	8	6
60	24	16	12	24	16	12
120	48	32	24	48	32	24

NOTE 1: For Gap Pattern ID 0, 1, 2 and 3, total number of interrupted subframes on MCG is MGL subframes when MG timing advance of 0ms is applied, and (MGL+1) subframes when MG timing advance of 0.5ms is applied.

NOTE 2: NR SCS of 120 kHz is only applicable to the case with per-UE measurement gap.

NOTE 3: Non-overlapped half-slots occur before and after the measurement gap.

Whether a Rel-15 UE can receive and/or transmit in those half-slots is up to UE implementation.

Table 9.1.2-4a: Total number of interrupted slots on serving cells during MGL for Asynchronous EN-DC with per-UE measurement gap or per-FR measurement gap for FR1

NR	Total number of interrupted slots on serving cells					
SCS (kHz)	When MG timing advance of 0ms is applied			When MG timing advance of 0.5ms is applied		
(,	MGL=6ms	MGL=4ms	MGL=3ms	MGL=6ms	MGL=4ms	MGL=3ms
15	7	5	4	7	5	4
30	13	9	7	13	9	7
60	25	17	13	25	17	13
120	49	33	25	49	33	25

NOTE 1: For Gap Pattern ID 0, 1, 2 and 3, total number of interrupted subframes on MCG is MGL subframes when MG timing advance of 0ms is applied, and (MGL+1) subframes when MG timing advance of 0.5ms is applied.

NOTE 2: NR SCS of 120 kHz is only applicable to the case with per-UE measurement gap.

In case that UE capable of per-FR measurement gap is configured with per-FR measurement gap for FR2 serving cells, total number of interrupted slots on FR2 serving cells during MGL is listed in Table 9.1.2-4b.

Table 9.1.2-4b: Total number of interrupted slots on FR2 serving cells during MGL for EN-DC, NR standalone operation (with single carrier, NR CA and NR-DC configuration) and NE-DC with per-UE measurement gap or per-FR measurement gap for FR2

NR	Total number of interrupted slots on FR2 serving cells						
SCS	When MG	timing advance	e of 0ms is	When MG timing advance of 0.25ms is			
(kHz)	applied			applied			
	MGL=5.5ms	MGL=3.5ms	MGL=1.5ms	MGL=5.5ms	MGL=3.5ms	MGL=1.5ms	
60	22	14	6	22	14	6	
120	44	28	12	44	28	12	

It is up to UE implementation whether or not the UE is able to conduct transmission in the following slot(s),

- when MGTA is not applied, in the L consecutive UL slots with respect to the SCS of the UL carrier with the same slot indices as the DL slots occurring immediately after measurement gap
- when MGTA is applied and the SCS of the UL carrier is other than 15kHz, in the L consecutive UL slots with respect to the SCS of the UL carrier with the same slot indices as the DL slots occurring immediately after measurement gap

 when MGTA is applied and the SCS of the UL carrier is 15kHz, in the L consecutive UL slots with respect to the SCS of the UL carrier with the same slot indices as the DL slots occurring immediately after the slot partially overlapped with measurement gap

where UL slot denotes that all the symbols in the slot are uplink symbols, and L=1 if  $(N_{\text{TA}} + N_{\text{TA offset}}) \times T_{\text{c}}$  for the UL transmission is less than the length of one slot; L=2 otherwise.

Note: Network is supposed to take into account the possible difference between the estimated TA at network and actual TA at UE when scheduling UE in the above slot(s).

## Table 9.1.2-5: (Void)

## 9.1.2.1 EN-DC: Measurement Gap Sharing

For E-UTRA-NR dual connectivity UE configured with per-UE measurement gap, measurement gap sharing shall be applies when UE requires measurement gaps to identify and measure cells on intra-frequency carriers or when SMTC configured for intra-frequency measurement are fully overlapping with per-UE measurement gaps, and when UE is configured to identify and measure cells on inter-frequency carriers, E-UTRA gap-needed inter-frequency carriers and inter-RAT UTRAN carriers and/or inter-RAT GSM carriers.

For E-UTRA-NR dual connectivity UE configured with per-FR1 measurement gap, measurement gap sharing shall be applied when UE requires measurement gaps to identify and measure cells on FR1 intra-frequency carriers or when SMTC configured for FR1 intra-frequency measurement are fully overlapping with per-FR1 measurement gaps, and when UE is configured to identify and measure cells on FR1 inter-frequency carriers, E-UTRA gap-needed inter-frequency carriers, inter-RAT UTRAN carriers and/or inter-RAT GSM carriers.

For E-UTRA-NR dual connectivity UE configured with per-FR2 measurement gap, measurement gap sharing shall be applied when UE requires measurement gaps to identify and measure cells on FR2 intra-frequency carriers or when SMTC configured for FR2 intra-frequency measurement are fully overlapping with per-FR2 measurement gaps, and when UE is configured to identify and measure cells on FR2 inter-frequency carriers.

When network signals "01", "10" or "11" with RRC parameter *MeasGapSharingScheme* [2][16]and the value of X is defined as in Table 9.1.2.1-1, and

- $K_{intra} = 1 / X * 100,$
- $K_{inter} = 1 / (100 X) * 100,$

When network signals "00" indicating equal splitting gap sharing, X is not applied.

The RRC parameter *MeasGapSharingScheme* shall be applied to the calculation of carrier specific scaling factor as specified in clause 9.1.5.2.1.

Table 9.1.2.1-1: Value of parameter X for EN-DC measurement gap sharing

measGapSharingScheme		Value of X (%)
	<b>'</b> 00'	Equal splitting
	'01'	25
	'10'	50
'11'		75
which measurements the table <i>to be ap</i>		Scheme is absent and

#### 9.1.2.1a SA: Measurement Gap Sharing

For NR standalone UE without NR-DC operation and configured with per-UE measurement gap, measurement gap sharing shall be applies when UE requires measurement gaps to identify and measure cells on intra-frequency carriers

or when SMTC configured for intra-frequency measurement are fully overlapping with per-UE measurement gaps, and when UE is configured to identify and measure cells on inter-frequency carriers, and/or inter-RAT E-UTRAN carriers.

For NR standalone UE without NR-DC operation and configured with per-FR1 measurement gap, measurement gap sharing shall be applied when UE requires measurement gaps to identify and measure cells on FR1 intra-frequency carriers or when SMTC configured for FR1 intra-frequency measurement are fully overlapping with per-FR1 measurement gaps, and when UE is configured to identify and measure cells on FR1 inter-frequency carriers and/or inter-RAT E-UTRAN carriers.

For NR standalone UE without NR-DC operation and configured with per-FR2 measurement gap, measurement gap sharing shall be applied when UE requires measurement gaps to identify and measure cells on FR2 intra-frequency carriers or when SMTC configured for FR2 intra-frequency measurement are fully overlapping with per-FR2 measurement gaps, and when UE is configured to identify and measure cells on FR2 inter-frequency carriers.

When network signals "01", "10" or "11" with RRC parameter *MeasGapSharingScheme* [2] and the value of X is defined as in Table 9.1.2.1a-1, and

- $K_{intra} = 1 / X * 100,$
- $K_{inter} = 1 / (100 X) * 100,$

When network signals "00" indicating equal splitting gap sharing, X is not applied.

The RRC parameter *MeasGapSharingScheme* shall be applied to the calculation of carrier specific scaling factor as specified in clause 9.1.5.2.2.

Table 9.1.2.1a-1: Value of parameter X for NR standalone measurement gap sharing

measGapSharingScheme		Value of X (%)	
'00'		Equal splitting	
	'01'	25	
	'10'	50	
'11'		75	
Note:	It is left to UE implementation to determine which measurement gap sharing scheme in the table to be applied, when MeasGapSharingScheme is absent and there is no stored value in the field.		

## 9.1.2.1b NE-DC: Measurement Gap Sharing

For NR-E-UTRA dual connectivity UE configured with per-UE measurement gap, measurement gap sharing shall be applied when UE requires measurement gaps to identify and measure cells on intra-frequency carriers or when SMTC configured for intra-frequency measurement are fully overlapping with per-UE measurement gaps, and when UE is configured to identify and measure cells on inter-frequency carriers, E-UTRA gap-needed inter-frequency carriers, and/or inter-RAT E-UTRA carriers.

For NR-E-UTRA dual connectivity UE configured with per-FR1 measurement gap, measurement gap sharing shall be applied when UE requires measurement gaps to identify and measure cells on FR1 intra-frequency carriers or when SMTC configured for FR1 intra-frequency measurement are fully overlapping with per-FR1 measurement gaps, and when UE is configured to identify and measure cells on inter-frequency carriers, E-UTRA gap-needed inter-frequency carriers, and/or inter-RAT E-UTRA carriers.

For NR-E-UTRA dual connectivity UE configured with per-FR2 measurement gap, measurement gap sharing shall be applied when UE requires measurement gaps to identify and measure cells on FR2 intra-frequency carriers or when SMTC configured for FR2 intra-frequency measurement are fully overlapping with per-FR2 measurement gaps, and when UE is configured to identify and measure cells on FR2 inter-frequency carriers.

When network signals "01", "10" or "11" with RRC parameter measGapSharingConfig [2][16] and the value of X is defined as in Table 9.1.2.1b-1, and

- $K_{intra} = 1 / X * 100,$
- $K_{inter} = 1 / (100 X) * 100,$

When network signals "00" indicating equal splitting gap sharing, X is not applied.

The RRC parameter *MeasGapSharingScheme* shall be applied to the calculation of carrier specific scaling factor as specified in clause 9.1.5.2.x.

Table 9.1.2.1b-1: Value of parameter X for NE-DC measurement gap sharing

measGapSharingScheme		Value of X (%)
'00'		Equal splitting
	'01'	25
	'10'	50
'11'		75
Note:	which measurements the table to be app	Scheme is absent and

## 9.1.2.1c NR-DC: Measurement Gap Sharing

For UE with NR-DC operation and configured with per-UE measurement gap, measurement gap sharing shall be applies when UE requires measurement gaps to identify and measure cells on intra-frequency carriers or when SMTC configured for intra-frequency measurement are fully overlapping with per-UE measurement gaps, and when UE is configured to identify and measure cells on inter-frequency carriers, and/or inter-RAT E-UTRAN carriers.

For UE with NR-DC operation and configured with per-FR1 measurement gap, measurement gap sharing shall be applied when UE requires measurement gaps to identify and measure cells on FR1 intra-frequency carriers or when SMTC configured for FR1 intra-frequency measurement are fully overlapping with per-FR1 measurement gaps, and when UE is configured to identify and measure cells on FR1 inter-frequency carriers and/or inter-RAT E-UTRAN carriers.

For UE with NR-DC operation and configured with per-FR2 measurement gap, measurement gap sharing shall be applied when UE requires measurement gaps to identify and measure cells on FR2 intra-frequency carriers or when SMTC configured for FR2 intra-frequency measurement are fully overlapping with per-FR2 measurement gaps, and when UE is configured to identify and measure cells on FR2 inter-frequency carriers.

When network signals "01", "10" or "11" with RRC parameter meas Gap Sharing Config [2] and the value of X is defined as in Table 9.1.2.1c-1, and

- $K_{intra} = 1 / X * 100,$
- $K_{inter} = 1 / (100 X) * 100,$

When network signals "00" indicating equal splitting gap sharing, X is not applied.

The RRC parameter *MeasGapSharingScheme* shall be applied to the calculation of carrier specific scaling factor as specified in clause 9.1.5.2.x.

Table 9.1.2.1c-1: Value of parameter X for NR-DC measurement gap sharing

measGapSharingCo	nfig   Value of X (%)
'00'	Equal splitting
'01'	25
'10'	50
'11'	75
which meas the table <i>to</i> <i>MeasGap</i> S	JE implementation to determine surement gap sharing scheme in be applied, when tharing Scheme is absent and stored value in the field.

## 9.1.3 UE Measurement capability

## 9.1.3.1 EN-DC: Monitoring of multiple layers using gaps

The requirements in this clause are applicable for UE capable of and configured with the EN-DC operation mode.

When monitoring of multiple inter-frequency E-UTRAN, inter-RAT NR, GSM, UTRA FDD and UTRA TDD carriers as configured by E-UTRA PCell, and inter-frequency NR carriers as configured by PSCell using gaps (or without using gaps provided the UE supports such capability) is configured, the UE shall be capable of performing one measurement of the configured measurement type (SS-RSRP, SS-RSRQ, SS-SINR, SFTD, E-UTRAN RSRP, E-UTRAN RSRQ, E-UTRAN RS-SINR measurements, UTRAN TDD P-CCPCH RSCP, UTRAN FDD CPICH measurements, GSM carrier RSSI, etc.) of detected cells on all the layers.

For UE configured with the EN-DC operation, the effective total number of frequencies excluding the frequencies of the PSCell, SCells, E-UTRA PCell, and E-UTRA SCells being monitored is N<sub>freq, EN-DC</sub>, which is defined as:

 $N_{\text{freq, EN-DC}} = N_{\text{freq, EN-DC, NR}} + N_{\text{freq, EN-DC, E-UTRA}} + N_{\text{freq, EN-DC, UTRA}} + M_{\text{EN-DC, GSM}}$ 

where

 $N_{\text{freq, EN-DC, E-UTRA}}$  is the number of E-UTRA inter-frequency carriers being monitored (FDD and TDD) as configured by E-UTRA PCell or via LPP [22],

 $N_{\text{freq, EN-DC, NR}} \leq N_{\text{freq, EN-DC, NR, inter-RAT}} + N_{\text{freq, EN-DC, NR, inter-freq}}$ 

where

 $N_{\text{freq, EN-DC, NR, inter-RAT}}$  is the number of NR inter-RAT carriers excluding NR serving carrier(s) being monitored as configured by E-UTRA PCell [15],

 $N_{\text{freq, EN-DC, NR, inter-freq}}$  is the number of NR inter-frequency carriers being monitored as configured by PSCell,

 $N_{\text{freq, EN-DC, UTRA}}$  is the number of UTRA inter-RAT carriers being monitored as configured by E-UTRA PCell (FDD and TDD).

 $M_{EN-DC, GSM}$  is an integer which is a function of the number of GSM inter-RAT carriers as configured by E-UTRA PCell on which measurements are being performed.  $M_{EN-DC, GSM}$  is equal to 0 if no GSM carrier is being monitored. For a MGRP of 40 ms,  $M_{EN-DC, GSM}$  is equal to 1 if cells on up to 32 GSM carriers are being measured. For a MGRP of 80 ms,  $M_{EN-DC, GSM}$  is equal to ceil( $N_{carriers,GSM}$ /20) where  $N_{carriers,GSM}$  is the number of GSM carriers on which cells are being measured.

## 9.1.3.1a SA: Monitoring of multiple layers using gaps

The requirements in this clause are applicable for UE configured with SA NR operation mode.

When monitoring of multiple inter-RAT E-UTRAN carriers and inter-frequency NR carriers using gaps (or without using gaps provided the UE supports such capability) is configured by PCell, the UE shall be capable of performing one measurement of the configured measurement type (SS-RSRP, SS-RSRQ, SS-SINR, E-UTRAN RSRP, E-UTRAN RSRQ, E-UTRA

For UE configured with the NR SA operation, the effective total number of frequencies, excluding the frequencies of the PCell, PSCell and SCells being monitored, is  $N_{\text{freq, SA}}$ , which is defined as:

 $N_{\text{freq, SA}} = N_{\text{freq, SA, NR}} + N_{\text{freq, SA, E-UTRA}},$ 

where

 $N_{\text{freq, SA, E-UTRA}}$  is the number of E-UTRA inter-RAT carriers being monitored (FDD and TDD) as configured by PCell or via LPP [22],

 $N_{\text{freq, SA, NR}}$  is the number of NR inter-frequency carriers being monitored as configured by PCell.

## 9.1.3.1b NE-DC: Monitoring of multiple layers using gaps

The requirements in this clause are applicable for UE capable of and configured with the NE-DC operation mode.

When monitoring of multiple inter-frequency E-UTRAN carriers as configured by E-UTRA PSCell, inter-RAT E-UTRAN carriers as configured by PCell, and inter-frequency NR carriers as configured by PCell using gaps (or without using gaps provided the UE supports such capability) is configured, the UE shall be capable of performing one measurement of the configured measurement type (SS-RSRP, SS-RSRQ, SS-SINR, SFTD, E-UTRAN RSRP, E-UTRAN RSRQ, and E-UTRAN RS-SINR measurements, etc.) of detected cells on all the layers.

For UE configured with the NE-DC operation, the effective total number of frequencies excluding the frequencies of the PCell, SCells, E-UTRA PSCell, and E-UTRA SCells being monitored is N<sub>freq, NE-DC</sub>, which is defined as:

 $N_{\text{freq, NE-DC}} = N_{\text{freq, NE-DC, NR}} + N_{\text{freq, NE-DC, E-UTRA}},$ 

where

 $N_{\text{freq, NE-DC, NR}}$  is the number of NR inter-frequency carriers being monitored as configured by PCell,

 $N_{\text{freq, NE-DC, E-UTRA}} \leq N_{\text{freq, NE-DC, E-UTRA, inter-RAT}} + N_{\text{freq, NE-DC, E-UTRA, inter-freq}}$ 

where

N<sub>freq, NE-DC, E-UTRA, inter-RAT</sub> is the number of E-UTRA inter-RAT carriers (FDD and TDD) excluding E-UTRA serving carrier(s) being monitored as configured by PCell or via LPP [22],

 $N_{\text{freq, NE-DC, E-UTRA, inter-freq}}$  is the number of E-UTRA inter-frequency carriers (FDD and TDD) being monitored as configured by E-UTRA PSCell [15] or via LPP [22].

## 9.1.3.1c NR-DC: Monitoring of multiple layers using gaps

The requirements in this clause are applicable for UE configured with NR-DC operation mode.

When monitoring of multiple inter-RAT E-UTRAN carriers and inter-frequency NR carriers using gaps (or without using gaps provided the UE supports such capability) as configured by PCell, and inter-frequency NR carriers as configured by PSCell is configured, the UE shall be capable of performing one measurement of the configured measurement type (SS-RSRP, SS-RSRQ, SS-SINR, E-UTRAN RSRP, E-UTRAN RSRQ, E-UTRAN RS-SINR measurements, etc.) of detected cells on all the layers.

For UE configured with the NR-DC operation, the effective total number of frequencies, excluding the frequencies of the PCell, PSCell and SCells being monitored, is  $N_{\text{freq, NR-DC}}$ , which is defined as:

 $N_{\text{freq, NR-DC}} = N_{\text{freq, NR-DC, NR}} + N_{\text{freq, NR-DC, E-UTRA}},$ 

where

 $N_{\text{freq, NR-DC, E-UTRA}}$  is the number of E-UTRA inter-RAT carriers being monitored (FDD and TDD) as configured by PCell or via LPP [22].

 $N_{\text{freq, NR-DC, NR}}$  is the number of NR inter-frequency carriers being monitored as configured by PCell and PSCell.

## 9.1.3.2 EN-DC: Maximum allowed layers for multiple monitoring

If a UE is configured with EN-DC operation, the UE shall be capable of monitoring at least:

- Depending on UE capability, 7 NR inter-frequency carriers configured by PScell, and
- Depending on UE capability, 7 NR inter-RAT carriers excluding NR serving carrier(s) configured by E-UTRA PCell [15], and
- Depending on UE capability, 6 E-UTRA TDD inter-frequency carriers configured by E-UTRA PCell [15], and
- Depending on UE capability, 6 E-UTRA FDD inter-frequency carriers configured by E-UTRA PCell [15], and
- Depending on UE capability, 3 FDD UTRA carriers, and

- Depending on UE capability, 3 TDD UTRA carriers, and
- Depending on UE capability, 32 GSM carriers (one GSM layer corresponds to 32 carriers), and
- Depending on UE capability, 1 E-UTRA FDD inter-frequency carrier for RSTD measurements configured via LPP [22], and
- Depending on UE capability, 1 E-UTRA TDD inter-frequency carrier for RSTD measurements configured via LPP [22].

In addition to the requirements defined above, the UE shall be capable of monitoring a total of at least 13 effective carrier frequency layers comprising of any above defined combination of NR, E-UTRA FDD, E-UTRA TDD, UTRA FDD, UTRA TDD and GSM (one GSM layer corresponds to 32 carriers) layers. The UE shall be capable of monitoring a total of at least 7 effective NR carrier frequency layers excluding NR serving carrier(s), comprising of any above defined combination of NR inter-RAT carriers excluding NR serving carrier(s) configured by E-UTRA PCell and NR inter-frequency carriers configured by PSCell.

When the E-UTRA PCell and PSCell configures the same NR carrier frequency layer to be monitored by the UE in synchronous intra-band EN-DC, this layer shall be counted only once to the total number of effective carrier frequency layers provided that the SFN-s and slot boundries are aligned, unless the configured NR carrier frequency layers to be monitored have

- different RSSI measurement resources or
- different deriveSSB-IndexFromCell indications or
- different SMTC configurations.

Note 1: The E-UTRA-NR dual connectivity capable UE configured with PSCell shall fulfil the requirements defined in only one of clause 9.1.3.2 and clause 8.1.2.1.1b.1 of TS 36.133 [15].

## 9.1.3.2a SA: Maximum allowed layers for multiple monitoring

If a UE is configured with SA NR operation mode, the UE shall be capable of monitoring at least:

- Depending on UE capability, 7 NR inter-frequency carriers configured by PCell, and
- Depending on UE capability, 7 E-UTRA TDD inter-RAT carriers configured by PCell, and
- Depending on UE capability, 7 E-UTRA FDD inter-RAT carriers configured by PCell, and
- Depending on UE capability, 1 E-UTRA FDD inter-RAT carrier for RSTD measurements configured via LPP [22], and
- Depending on UE capability, 1 E-UTRA TDD inter-RAT carrier for RSTD measurements configured via LPP [22].

In addition to the requirements defined above, the UE shall be capable of monitoring a total of at least [13] effective carrier frequency layers comprising of any above defined combination of NR, E-UTRA FDD and E-UTRA TDD layers.

## 9.1.3.2b NE-DC: Maximum allowed layers for multiple monitoring

If a UE is configured with NE-DC operation mode, the UE shall be capable of monitoring at least:

- Depending on UE capability, 7 NR inter-frequency carriers configured by PCell, and
- Depending on UE capability, 6 E-UTRA TDD inter-RAT carriers excluding E-UTRA serving carriers configured by PCell, and
- Depending on UE capability, 6 E-UTRA FDD inter-RAT carriers excluding E-UTRA serving carriers configured by PCell, and
- Depending on UE capability, 6 E-UTRA TDD inter-frequency carriers configured by E-UTRA PSCell [15], and
- Depending on UE capability, 6 E-UTRA FDD inter-frequency carriers configured by E-UTRA PSCell [15], and

- Depending on UE capability, 1 E-UTRA FDD inter-frequency carrier for RSTD measurements configured via LPP [22], and
- Depending on UE capability, 1 E-UTRA TDD inter-frequency carrier for RSTD measurements configured via LPP [22].

In addition to the requirements defined above, the UE shall be capable of monitoring a total of at least 13 effective carrier frequency layers comprising of any above defined combination of NR, E-UTRA FDD, and E-UTRA TDD layers. The UE shall be capable of monitoring a total of at least 6 effective E-UTRA carrier frequency layers, excluding E-UTRA serving carrier(s), comprising of any above defined combination of E-UTRA inter-RAT carriers excluding E-UTRA serving carrier(s) configured by PCell and E-UTRA inter-frequency carriers configured by E-UTRA PSCell.

## 9.1.3.2c NR-DC: Maximum allowed layers for multiple monitoring

If a UE is configured with NR-DC operation, the UE shall be capable of monitoring at least:

- Depending on UE capability, 7 NR inter-frequency carriers configured by PCell, and
- Depending on UE capability, 7 NR inter-frequency carriers configured by PSCell, and
- Depending on UE capability, 7 E-UTRA TDD inter-RAT carriers configured by PCell, and
- Depending on UE capability, 7 E-UTRA FDD inter-RAT carriers configured by PCell, and
- Depending on UE capability, 1 E-UTRA FDD inter-RAT carrier for RSTD measurements configured via LPP [22], and
- Depending on UE capability, 1 E-UTRA TDD inter-RAT carrier for RSTD measurements configured via LPP [22].

In addition to the requirements defined above, the UE shall be capable of monitoring a total of at least [13] effective carrier frequency layers comprising of any above defined combination of NR, E-UTRA FDD and E-UTRA TDD layers. The UE shall be capable of monitoring a total of at least [7] effective NR carrier frequency layers excluding NR serving carrier(s), which are configured by PCell and PSCell.

When PCell and PSCell configures the same NR carrier frequency layer to be monitored by the UE in NR-DC, this layer shall be counted only once to the total number of effective carrier frequency layers provided that the SFN-s and slot boundries are aligned, unless the configured NR carrier frequency layers to be monitored have

- different RSSI measurement resources or
- different deriveSSB-IndexFromCell indications or
- different SMTC configurations.

# 9.1.4 Capabilities for Support of Event Triggering and Reporting Criteria

#### 9.1.4.1 Introduction

This clause contains requirements on UE capabilities for support of event triggering and reporting criteria. As long as the measurement configuration does not exceed the requirements stated in clause 9.1.4.2, the UE shall meet all other performance requirements defined in clause 9 and clause 10.

The UE can be requested to make measurements under different measurement identities defined in TS 38.331 [2]. Each measurement identity corresponds to either event based reporting, periodic reporting, or no reporting. In case of event based reporting, each measurement identity is associated with an event triggering criterion. In case of periodic reporting, a measurement identity is associated with one periodic reporting criterion. In case of no reporting, a measurement identity is associated with one no reporting criterion.

The purpose of this clause is to set some limits on the number of different event triggering, periodic, and no reporting criteria the UE may be requested to track in parallel.

#### 9.1.4.2 Requirements

In this clause a reporting criterion corresponds to either one event (in the case of event based reporting), or one periodic reporting criterion (in case of periodic reporting), or one no reporting criterion (in case of no reporting). For event based reporting, each instance of event, with the same or different event identities, is counted as separate reporting criterion in Table 9.1.4.2-1.

The UE shall be able to support in parallel per category up to E<sub>cat</sub> reporting criteria according to Table 9.1.4.2-1. For the measurement categories belonging to intra-frequency, inter-frequency, and inter-RAT measurements (i.e. without counting other categories that the UE shall always support in parallel), the UE need not support more than the total number of reporting criteria as follows:

- For UE configured with EN-DC:  $E_{cat.EN-DC.NR} + E_{cat.EN-DC.E-UTRA}$ , where

 $E_{cat,EN-DC,NR} = 10 + 9 \times n$  is the total number of NR reporting criteria configured by PSCell and E-UTRA PCell applicable for UE configured with EN-DC according to Table 9.1.4.2-1, and n is the number of configured NR serving frequencies, including PSCell and SCells carrier frequencies,

 $E_{cat,EN-DC,E-UTRA}$  is the total number of E-UTRA reporting criteria configured by E-UTRA PCell except PSCell and SCells carrier frequencies, as specified in TS 36.133 [15] for UE configured with EN-DC.

- For UE configured with NE-DC:  $E_{cat,NE-DC,NR} + E_{cat,NE-DC,E-UTRA}$ , where

 $E_{cat,NE-DC,NR} = 10 + 9 \times n$  is the total number of NR reporting criteria according to Table 9.1.4.2-1, and n is the number of configured NR serving frequencies, including PCell and SCells carrier frequencies,

 $E_{cat,NE-DC,E-UTRA} = E_{cat,NE-DC,E-UTRA,inter-RAT} + E_{cat,NE-DC,E-UTRA,intra-RAT}$ , where

 $E_{cat,NE-DC,E-UTRA,inter-RAT}$  is the total number of inter-RAT E-UTRA reporting criteria configured by PCell except E-UTRA PSCell and E-UTRA SCells carrier frequencies, according to Table 9.1.4.2-1,

 $E_{cat,NE-DC,E-UTRA,intra-RAT}$  is the total number of E-UTRA reporting criteria including E-UTRA PSCell and E-UTRA SCells carrier frequencies as specified in TS 36.133 [15] for UE configured with NE-DC.

- For UE configured with SA operation mode:  $E_{cat,SA,NR} + E_{cat,SA,E-UTRA}$ , where

 $E_{cat,SA,NR} = 10 + 9 \times n$  is the total number of NR reporting criteria according to Table 9.1.4.2-1, and n is the number of configured NR serving frequencies, including PCell, and SCells carrier frequencies,

 $E_{cat,SA,E-UTRA}$  is the total number of inter-RAT E-UTRA reporting criteria according to Table 9.1.4.2-1.

- For UE configured with NR-DC:  $E_{cat,NR-DC,NR} + E_{cat,NR-DC,E-UTRA}$ , where

 $E_{cat,NR-DC,NR} = 10 + 9 \times n$  is the total number of NR reporting criteria according to Table 9.1.4.2-1, and n is the number of configured NR serving frequencies, including PCell, PSCell and SCells carrier frequencies,

 $E_{cat,NR-DC,E-UTRA}$  is the total number of inter-RAT E-UTRA reporting criteria according to Table 9.1.4.2-1.

Table 9.1.4.2-1: Requirements for reporting criteria per measurement category

Measurement category	Ecat	Note		
Intra-frequency Note 1,2,3,4,5	9	Events for any one or a combination of intra- frequency SS-RSRP, SS-RSRQ, and SS-SINR for NG-RAN intra-frequency cells		
Inter-frequency Note 2,3,4,5	10	Events for any one or a combination of inter- frequency SS-RSRP, SS-RSRQ, and SS-SINR for NG-RAN inter-frequency cells		
Inter-RAT (E-UTRA FDD, E-UTRA TDD) Note 2,4,5	10	Only applicable for UE with this (inter-RAT) capability. These reporting criteria apply for any E-UTRA carrier frequencies other than the carrier frequency of the E-UTRA PSCell or E-UTRA SCell.		
Inter-RAT (E-UTRA FDD, E-UTRA TDD) RSTD Note 2,4,5	1	Inter-RAT RSTD measurement reporting for UE supporting OTDOA; 1 report capable of minimum 16 inter-RAT cell measurements. Only applicable for UE with this (inter-RAT RSTD via LPP [22]) capability. These reporting criteria apply for any E-UTRA carrier frequencies other than the carrier frequency of the E-UTRA PSCell or E-UTRA SCell.		
Inter-RAT (E-UTRA FDD, E-UTRA TDD) RSRP and RSRQ measurements for E-CID Note 2,4,5	1	Inter-RAT RSRP and RSRQ measurements for E-CID reported to E-SMLC via LPP [22]. One report capable of at least in total 10 inter-RAT RSRP and RSRQ measurements. Applicable to UE capable of reporting inter-RAT RSRP and RSRQ to E-SMLC via LPP. These reporting criteria apply for any E-UTRA carrier frequencies other than the carrier frequency of the E-UTRA PSCell or E-UTRA SCell.		
NOTE 1: When the UE is configured with PSCell and SCell carrier frequencies, E <sub>cat</sub> for Intra-frequency is applied per corresponding NR serving frequency.  NOTE 2: Applicable for UE configured with SA NR operation mode.				
NOTE 3: Applicable for UE configured with EN-DC operation mode.				

# 9.1.5 Carrier-specific scaling factor

This clause specifies the derivation of carrier-specific scaling factor (CSSF) values, which scales the measurement delay requirements given in clause 9.2, 9.3 and 9.4 when UE is configured to monitor multiple measurement objects. The CSSF values are categorized into CSSF<sub>outside\_gap,i</sub> and CSSF<sub>within\_gap,i</sub>, for the measurements conducted outside measurement gaps and within measurement gaps, respectively.

## 9.1.5.1 Monitoring of multiple layers outside gaps

NOTE 4: Applicable for UE configured with NE-DC operation mode. NOTE 5: Applicable for UE configured with NR-DC operation mode.

The carrier-specific scaling factor CSSF<sub>outside\_gap,i</sub> for measurement object *i* derived in this chapter is applied to following measurement types:

- Intra-frequency measurement with no measurement gap in clause 9.2.5, when none of the SMTC occasions of this intra-frequency measurement object are overlapped by the measurement gap.
- Intra-frequency measurement with no measurement gap in clause 9.2.5, when part of the SMTC occasions of this intra-frequency measurement object are overlapped by the measurement gap.

UE is expected to conduct the measurement of this measurement object *i* only outside the measurement gaps.

If the higher layer signaling in TS 38.331 [2] signaling of *smtc2* is present and *smtc1* is fully overlapping with measurement gaps and *smtc2* is partially overlapping with measurement gaps, CSSF<sub>outside\_gap,i</sub> and requirements derivied from CSSF<sub>outside\_gap,i</sub> are not specified.

The UE cell identification and measurement periods derived based on  $CSSF_{outside\_gap,i}$  in clauses 9.2.5.1, 9.2.5.2 may be extended for measurement objects of which the cell identification and measurement periods are overlapped with  $T_{measure}$  specified in clause 9.3.8 when no measurement gaps are provided.

# 9.1.5.1.1 EN-DC mode: carrier-specific scaling factor for SSB-based measurements performed outside gaps

For UE configured with the E-UTRA-NR dual connectivity operation, the carrier-specific scaling factor CSSF<sub>outside\_gap,i</sub> for intra-frequency SSB-based measurements performed outside measurements gaps will be as specified in Table 9.1.5.1.1-1.

Table 9.1.5.1.1-1: CSSF<sub>outside\_gap,i</sub> scaling factor for EN-DC mode

Scenario	CSSF <sub>outside_ga</sub> <sub>p,i</sub> for FR1 PSCC	CSSF <sub>outside_gap</sub> , i for FR1 SCC	CSSF <sub>outside_gap,</sub> i for FR2 PSCC	CSSF <sub>outside_gap,i</sub> for FR2 SCC where neighbour cell measurement is required <sup>Note 2</sup>	CSSF <sub>outside_gap,i</sub> for FR2 SCC where neighbour cell measurement is not required
EN-DC with FR1 only CA	1	Number of configured FR1 SCell(s)	N/A	N/A	N/A
EN-DC with FR2 only intra band CA	N/A	N/A	1	N/A	Number of configured FR2 SCells
EN-DC with FR1 +FR2 CA (FR1 PSCell) Note	1	2×(Number of configured SCell(s)-1)	N/A	2	2×(Number of configured SCell(s)-1)
EN-DC with FR1 +FR2 CA (FR2 PSCell) Note 1	N/A	Number of configured SCell(s)	1	N/A	Number of configured SCell(s)

Note 1: Only one NR FR1 operating band and one NR FR2 operating band are included for FR1+FR2 inter-band EN-DC. Note 2: Selection of FR2 SCC where neighbour cell measurement is required follows clause 9.2.3.2.

# 9.1.5.1.2 SA mode: carrier-specific scaling factor for SSB-based measurements performed outside gaps

For UE in SA operation mode, the carrier-specific scaling factor CSSF<sub>outside\_gap,i</sub> for intra-frequency SSB-based measurements performed outside measurements gaps will be as specified in Table 9.1.5.1.2-1, which shall also be applied for a UE configured with NE-DC operation.

Table 9.1.5.1.2-1: CSSF<sub>outside\_gap,i</sub> scaling factor for SA mode

Scenario	CSSF <sub>outside_gap</sub> , i for FR1 PCC	CSSF <sub>outside_gap</sub> , i for FR1 SCC	CSSF <sub>outside_ga</sub> <sub>p,i</sub> for FR2 PCC	CSSF <sub>outside_gap,i</sub> for FR2 SCC where neighbour cell measurement is required	CSSF <sub>outside_gap,i</sub> for FR2 SCC where neighbour cell measurement is not required
FR1 only CA	1	Number of configured FR1 SCell(s)	N/A	N/A	N/A
FR2 only intra band CA	N/A	N/A	1	N/A	Number of configured FR2 SCell(s)
FR1 +FR2 CA (FR1 PCeII) Note 1	1	2×(Number of configured SCell(s)-1)	N/A	2	2×(Number of configured SCell(s)-1)

Note 1: Only one FR1 operating band and one FR2 operating band are included for FR1+FR2 inter-band CA. Note 2: Selection of FR2 SCC where neighbour cell measurement is required follows clause 9.2.3.2.

in FR2

# 9.1.5.1.3 NR-DC mode: carrier-specific scaling factor for SSB-based measurements performed outside gaps

For UE configured with NR-DC operation, the carrier-specific scaling factor CSSF<sub>outside\_gap,i</sub> for intra-frequency SSB-based measurements performed outside measurements gaps will be as specified in Table 9.1.5.1.3-1.

Table 9.1.5.1.3-1: CSSF<sub>outside\_gap,i</sub> scaling factor for NR-DC mode

Scenario	CSSF <sub>outside_gap</sub> ,i for FR1 PCC	CSSF <sub>outside_gap,i</sub> for FR1 SCC	CSSF <sub>outside_gap,i</sub> for FR2 PSCC	CSSF <sub>outside_gap,i</sub> for FR2 SCC where neighbour cell measurement is not required	
FR1 + FR2 NR- DC (FR1 PCell and FR2 PScell) Note 1	1	2×(Number of configured SCell(s))	2	2×(Number of configured SCell(s))	
Note 1: NR-DC in Rel-15 only includes the scenarios where all serving cells in MCG in FR1 and all serving cells in SCG					

9.1.5.1.4 NE-DC mode: carrier-specific scaling factor for SSB-based measurements performed outside gaps

For UE configured with NE-DC operation, the carrier-specific scaling factor CSSF<sub>outside\_gap,i</sub> for intra-frequency SSB-based measurements performed outside measurements gaps will be as specified in Table 9.1.5.1.4-1.

Table 9.1.5.1.4-1: CSSF<sub>outside gap,i</sub> scaling factor for NE-DC mode

Scenario	CSSF <sub>outside_gap</sub> , i for FR1 PCC	CSSF <sub>outside_gap</sub> ,i for FR1 SCC	CSSF <sub>outside_ga</sub> <sub>p,i</sub> for FR2 PCC	CSSF <sub>outside_gap,i</sub> for FR2 SCC where neighbour cell measurement is required	CSSF <sub>outside_gap,i</sub> for FR2 SCC where neighbour cell measurement is not required
NE-DC with FR1 only CA	1	Number of configured FR1 SCell(s)	N/A	N/A	N/A
NE-DC with FR2 only intra band CA	N/A	N/A	1	N/A	Number of configured FR2 SCell(s)
NE-DC with FR1 +FR2 CA (FR1 PCeII) Note 1	1	2×(Number of configured SCell(s)-1)	N/A	2	2×(Number of configured SCell(s)-1)

Note 1: Only one FR1 operating band and one FR2 operating band are included for FR1+FR2 inter-band CA.

Note 2: Selection of FR2 SCC where neighbour cell measurement is required follows clause 9.2.3.2.

## 9.1.5.2 Monitoring of multiple layers within gaps

The carrier-specific scaling factor  $CSSF_{within\_gap,i}$  for measurement object *i* derived in this chapter is applied to following measurement types:

- Intra-frequency measurement object with no measurement gap in clause 9.2.5, when all of the SMTC occasions of this intra-frequency measurement object are overlapped by the measurement gap.
- Intra-frequency measurement object with measurement gap in clause 9.2.6.
- Inter-frequency measurement object in clause 9.3.
- E-UTRA Inter-RAT measurement object in clauses 9.4.2 and 9.4.3.
- E-UTRA Inter-RAT RSTD and E-CID measurements in clauses 9.4.4 and 9.4.5.
- NR Inter-RAT measurement object configured by the E-UTRAN PCell (TS 36.133 [15] clause 8.17.4).
- E-UTRAN Inter-frequency measurement object configured by the E-UTRAN PCell (TS 36.133 [15] clause 8.17.3) and by the E-UTRAN PSCell (TS 36.133 [15] clause 8.19.3).

- E-UTRAN Inter-frequency RSTD measurement configured by the E-UTRAN PCell (TS 36.133 [15] clause 8.17.15).
- UTRA Inter-RAT measurement object configured by the E-UTRAN PCell (TS 36.133 [15] clauses 8.17.5 to 8.17.12).
- GSM Inter-RAT measurements configured by the E-UTRAN PCell (TS 36.133 [15] clauses 8.17.13 and 8.17.14).

UE is expected to conduct the measurement of this measurement object i only within the measurement gaps.

If the higher layer signaling in TS 38.331 [2] signaling of *smtc2* is present and *smtc1* is fully overlapping with measurement gaps and *smtc2* is partially overlapping with measurement gaps, CSSF<sub>within\_gap,i</sub> and requirements derivied from CSSF<sub>outside gap,i</sub> are not specified.

# 9.1.5.2.1 EN-DC mode: carrier-specific scaling factor for SSB-based measurements performed within gaps

Editor's note: The scaling value CSSF<sub>within gap,i</sub> below has been derived without considering GSM inter-RAT carriers.

When one or more measurement objects are monitored within measurement gaps, the carrier specific scaling factor for a target measurement object with index i is designated as CSSF<sub>within gap,i</sub> and is derived as described in this clause.

If measurement object *i* refers to an RSTD measurement with periodicity Tprs>160ms or with periodicity Tprs=160ms but *prs-MutingInfo-r9* is configured, CSSF<sub>within\_gap,i</sub>=1. Otherwise, the CSSF<sub>within\_gap,i</sub> for other measurement objects (including RSTD measurement with periodicity Tprs=160ms) participate in the gap competition are derived as below.

For each measurement gap *j* not used for an RSTD measurement with periodicity Tprs>160ms or with periodicity Tprs=160ms but *prs-MutingInfo-r9* is configured within an arbitrary 160ms period, count the total number of intrafrequency measurement objects and interfrequency/interRAT measurement objects which are candidates to be measured within the gap *j*.

- An NR measurement object is a candidate to be measured in a gap if its SMTC duration is fully covered by the MGL excluding RF switching time. For intra-frequency NR carriers, if the higher layer in TS 38.331 [2] signaling of *smtc2* is configured, the assumed periodicity of SMTC occasions corresponds to the value of higher layer parameter *smtc2*; otherwise the assumed periodicity of SMTC occasions corresponds to the value of higher layer parameter *smtc1*
- An inter-RAT measurement object configured by PSCell is a candidate to be measured in all measurement gaps.
- An inter-RAT UTRA measurement object configured by E-UTRA PCell [15] is a candidate to be measured in all measurement gaps.
- An inter-frequency E-UTRA measurement object is a candidate to be measured in all measurement gaps.

For UEs which support and are configured with per FR gaps, the counting is done on a per FR basis, and for UEs which are configured with per UE gaps the counting is done on a per UE basis.

- $M_{intra,i,j}$ : Number of intra-frequency measurement objects which are candidates to be measured in gap j where the measurement object i is also a candidate. Otherwise  $M_{intra,i,j}$  equals 0.
- M<sub>inter,i,j</sub>: Number of NR inter-frequency measurement objects or NR inter-RAT measurement objects configured by E-UTRA PCell, EUTRA inter-frequency measurement objects configured by E-UTRA PCell, UTRA inter-RAT measurement objects configured by E-UTRA PCell which are candidates to be measured in gap *j* where the measurement object *i* is also a candidate. Otherwise M<sub>inter,i,j</sub> equals 0.
- $M_{\text{tot,i,j}} = M_{\text{intra,i,j}} + M_{\text{inter,i,j}}$ : Total number of intra-frequency, inter-frequency and inter-RAT measurement objects which are candidates to be measured in gap j where the measurement object i is also a candidate. Otherwise  $M_{\text{tot,i,i}}$  equals 0.

For each measurement gap j used for an RSTD measurement with periodicity Tprs>160ms or with periodicity Tprs=160ms but prs-MutingInfo-r9 is configured within an arbitrary 160ms period,  $M_{intra,i,j} = M_{inter,i,j} = M_{tot,i,j} = 0$ .

The carrier specific scaling factor CSSF<sub>within gap,i</sub> is given by:

If measGapSharingScheme is equal sharing, CSSF<sub>within gap,i</sub>=  $\max(\text{ceil}(R_i \times M_{\text{tot,i,j}}))$ , where j=0...(160/MGRP)-1

If measGapSharingScheme is not equal sharing and

- measurement object i is an intra-frequency measurement object, CSSF<sub>within gap,i</sub> is the maximum among
  - ceil( $R_i \times K_{intra} \times M_{intra,i,j}$ ) in gaps where  $M_{inter,i,j} \neq 0$ , where j=0...(160/MGRP)-1
  - $ceil(R_i \times M_{intra,i,j})$  in gaps where  $M_{inter,i,j}=0$ , where j=0...(160/MGRP)-1
- measurement object *i* is an inter-frequency or inter-RAT measurement object, CSSF<sub>within\_gap,i</sub> is the maximum among
  - ceil( $R_i \times K_{inter} \times M_{inter,i,j}$ ) in gaps where  $M_{intra,i,j} \neq 0$ , where j=0...(160/MGRP)-1
  - ceil( $R_i \times M_{inter,i,j}$ ) in gaps where  $M_{intra,i,j}=0$ , where j=0...(160/MGRP)-1

Where R<sub>i</sub> is the maximal ratio of the number of measurement gap where measurement object *i* is a candidate to be measured over the number of measurement gap where measurement object *i* is a candidate and not used for RSTD measurement with periodicity Tprs>160ms or with periodicity Tprs=160ms but *prs-MutingInfo-r9* is configured within an arbitrary 1280ms period.

# 9.1.5.2.2 SA mode: carrier-specific scaling factor for SSB-based measurements performed within gaps

When one or more measurement objects are monitored within measurement gaps, the carrier specific scaling factor for a target measurement object with index i is designated as CSSF<sub>within gap,i</sub> and is derived as described in this clause.

If measurement object *i* refers to an RSTD measurement with periodicity Tprs>160ms or with periodicity Tprs=160ms but *prs-MutingInfo-r9* is configured, CSSF<sub>within\_gap,i</sub>=1. Otherwise, the the CSSF<sub>within\_gap,i</sub> for other measurement objects (including RSTD measurement with periodicity Tprs=160ms) participate in the gap competition and the CSSF<sub>within\_gap,i</sub> are derived as below.

For each measurement gap *j* not used for an RSTD measurement with periodicity Tprs>160ms or with periodicity Tprs=160ms but *prs-MutingInfo-r9* is configured within an arbitrary 160ms period, count the total number of intrafrequency measurement objects and interfrequency/interRAT measurement objects which are candidates to be measured within the gap *j*.

- An NR measurement object is a candidate to be measured in a gap if its SMTC duration is fully covered by the MGL excluding RF switching time. For intra-frequency NR measurement objects, if the higher layer in TS 38.331 [2] signaling of *smtc2* is configured, the assumed periodicity of SMTC occasions corresponds to the value of higher layer parameter *smtc2*; otherwise the assumed periodicity of SMTC occasions corresponds to the value of higher layer parameter *smtc1*.
- An inter-RAT measurement object is a candidate to be measured in all meausrement gaps.
- An inter-frequency SFTD measurement object is a candidate to be measured in all measurement gaps.

For UEs which support and are configured with per FR gaps, the counting is done on a per FR basis, and for UEs which are configured with per UE gaps the counting is done on a per UE basis.

 $M_{intra,i,j}$ : Number of intra-frequency measurement objects which are candidates to be measured in gap j where the measurement object i is also a candidate. Otherwise  $M_{intra,i,j}$  equals 0.

 $M_{\text{inter,i,j}}$ : Number of NR inter-frequency and EUTRA inter-RAT measurement objects which are candidates to be measured in gap j where the measurement object i is also a candidate. Otherwise  $M_{\text{inter,i,j}}$  equals 0.

 $M_{\text{tot,i,j}} = M_{\text{intra,i,j}} + M_{\text{inter,i,j}}$ : Total number of intra-frequency, inter-frequency and inter-RAT measurement objects which are candidates to be measured in gap j where the measurement object i is also a candidate. Otherwise  $M_{\text{tot,i,j}}$  equals 0.

For each measurement gap j used for an RSTD measurement with periodicity Tprs>160ms or with periodicity Tprs=160ms but prs-MutingInfo-r9 is configured within an arbitrary 160ms period,  $M_{intra,i,j} = M_{inter,i,j} = M_{tot,i,j} = 0$ .

The carrier specific scaling factor CSSF<sub>within gap,i</sub> is given by:

If measGapSharingScheme is equal sharing, CSSF<sub>within gap,i</sub>= max(ceil(R<sub>i</sub>×M<sub>tot,i,j</sub>)), where j=0...(160/MGRP)-1

If measGapSharingScheme is not equal sharing and

- measurement object i is an intra-frequency measurement object,  $CSSF_{within\ gap,i}$  is the maximum among
  - $ceil(R_i \times K_{intra} \times M_{intra,i,j})$  in gaps where  $M_{inter,i,j} \neq 0$ , where j=0...(160/MGRP)-1
  - $ceil(R_i \times M_{intra,i,j})$  in gaps where  $M_{inter,i,j}=0$ , where j=0...(160/MGRP)-1
- measurement object *i* is an inter-frequency or inter-RAT measurement object, CSSF<sub>within\_gap,i</sub> is the maximum among
  - ceil( $R_i \times K_{inter} \times M_{inter,i,j}$ ) in gaps where  $M_{intra,i,j} \neq 0$ , where j=0...(160/MGRP)-1
  - ceil( $R_i \times M_{inter,i,j}$ ) in gaps where  $M_{intra,i,j}=0$ , where j=0...(160/MGRP)-1

Where R<sub>i</sub> is the maximal ratio of the number of measurement gap where measurement object *i* is a candidate to be measured over the number of measurement gap where measurement object *i* is a candidate and not used for RSTD measurement with periodicity Tprs>160ms or with periodicity Tprs=160ms but *prs-MutingInfo-r9* is configured within an arbitrary 1280ms period.

CSSF<sub>within\_gap,k</sub>=1 during  $T_{Detect, E-UTRAN \, FDD}$  specified in clause 9.4.4.1.2.2 and  $T_{Detect, E-UTRAN \, TDD}$  specified in clause 9.4.4.2.2.2, where k is the carrier frequency where the UE is performing cell detection of the inter-RAT E-UTRA OTDOA assistance data reference cell when acquiring the subframe and slot timing of the cell according to clause 9.4.4. In this case, the UE cell identification and measurement periods derived based on CSSF<sub>within\_gap,i</sub> in clauses 9.2.5.1, 9.2.5.2, 9.2.6.2, 9.2.6.3, 9.3.4, 9.3.5, 9.4.2.2, and 9.4.2.3 may be extended for measurement objects of which the cell identification and measurement periods are overlapped with  $T_{Detect, E-UTRAN \, FDD}$  and  $T_{Detect, E-UTRAN \, TDD}$ .

# 9.1.5.2.3 NE-DC: carrier-specific scaling factor for SSB-based measurements performed within gaps

When one or more measurement objects are monitored within measurement gaps, the carrier specific scaling factor for a target measurement object with index i is designated as CSSF<sub>within gap,i</sub> and is derived as described in this clause.

If measurement object *i* refers to an RSTD measurement with periodicity Tprs>160ms or with periodicity Tprs=160ms but *prs-MutingInfo-r9* is configured, CSSF<sub>within\_gap,i</sub>=1. Otherwise, the CSSF<sub>within\_gap,i</sub> for other measurement objects (including RSTD measurement with periodicity Tprs=160ms) participate in the gap competition are derived as below.

For each measurement gap *j* not used for an RSTD measurement with periodicity Tprs>160ms or with periodicity Tprs=160ms but *prs-MutingInfo-r9* is configured within an arbitrary 160ms period, count the total number of intrafrequency measurement objects and interfrequency/interRAT measurement objects which are candidates to be measured within the gap *j*.

- An NR measurement object is a candidate to be measured in a gap if its SMTC duration is fully covered by the MGL excluding RF switching time. For intra-frequency NR measurement objects, if the higher layer in TS 38.331 [2] signaling of *smtc2* is configured, the assumed periodicity of SMTC occasions corresponds to the value of higher layer parameter *smtc2*; otherwise the assumed periodicity of SMTC occasions corresponds to the value of higher layer parameter *smtc1*.
- An inter-RAT measurement object is a candidate to be measured in all meausrement gaps.
- An inter-frequency E-UTRA measurement object is a candidate to be measured in all measurement gaps.

For UEs which support and are configured with per FR gaps, the counting is done on a per FR basis, and for UEs which are configured with per UE gaps the counting is done on a per UE basis.

If the number of configured inter-frequency and inter-RAT measuerement objects is non-zero and the UE is configured with per UE gaps, or if the UE is configured with per FR gaps:

FR1 and FR2 intra-frequency measurement objects belong to group A

Inter-frequency and inter-RAT measurement objects belong to group B

 $M_{groupA,i,j}$ : Sum of the number of FR1 intra-frequency measurement objects  $M_{intra-FR1,i,j}$  and the number of FR2 intra-frequency measurement objects  $M_{intra-FR2,i,j}$  which are candidates to be measured in gap j where the measurement object i is also a candidate. Otherwise  $M_{groupA,i,j}$  equals 0.

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 $M_{groupBi,j}$ : Number of NR inter-frequency and EUTRA inter-RAT measurement objects which are candidates to be measured in gap j where the measurement object i is also a candidate. Otherwise  $M_{groupB,i,j}$  equals 0.

If the number of configured inter-frequency and inter-RAT measuerement objects is zero and the UE is configured with per UE gaps:

FR1 intra-frequency measurement objects belong to group A

FR2 intra-frequency measurement objects belong to group B

 $M_{groupA,i,j}$ : The number of FR1 intra-frequency measurement objects  $M_{intra-FR1,i,j}$  which are candidates to be measured in gap j where the measurement object i is also a candidate. Otherwise  $M_{groupA,i,j}$  equals 0.

 $M_{groupBi,j}$ : The number of FR2 intra-frequency measurement objects  $M_{intra-FR2,i,j}$  which are candidates to be measured in gap j where the measurement object i is also a candidate. Otherwise  $M_{groupB,i,j}$  equals 0.

 $M_{\text{tot,i,j}} = M_{\text{groupA,i,j}} + M_{\text{groupB,i,j}}$ : Total number of group A and group B measurement objects which are candidates to be measured in gap *j* where the measurement object *i* is also a candidate. Otherwise  $M_{\text{tot,i,j}}$  equals 0.

For each measurement gap j used for an RSTD measurement with periodicity Tprs>160ms or with periodicity Tprs=160ms but prs-MutingInfo-r9 is configured within an arbitrary 160ms period,  $M_{intra,i,j} = M_{inter,i,j} = M_{tot,i,j} = 0$ .

The carrier specific scaling factor CSSF<sub>within\_gap,i</sub> is given by:

If measGapSharingScheme is equal sharing, CSSF<sub>within gap,i</sub>= max(ceil(R<sub>i</sub>×M<sub>tot,i,j</sub>)), where j=0...(160/MGRP)-1

If measGapSharingScheme is not equal sharing and

- measurement object i is a group A measurement object,  $CSSF_{within\_gap,i}$  is the maximum among
  - ceil( $R_i \times K_{intra} \times M_{groupA,i,j}$ ) in gaps where  $M_{groupB,i,j} \neq 0$ , where j=0...(160/MGRP)-1
  - $ceil(R_i \times M_{groupA,i,j})$  in gaps where  $M_{groupB,i,j}=0$ , where j=0...(160/MGRP)-1
- measurement object i is an group B measurement object, CSSF<sub>within gap,i</sub> is the maximum among
  - $ceil(R_i \times K_{inter} \times M_{groupBi,j})$  in gaps where  $M_{groupA,i,j} \neq 0$ , where j=0...(160/MGRP)-1
  - ceil( $R_i \times M_{groupB,i,j}$ ) in gaps where  $M_{groupA,i,j}=0$ , where j=0...(160/MGRP)-1

Where R<sub>i</sub> is the maximal ratio of the number of measurement gap where measurement object *i* is a candidate to be measured over the number of measurement gap where measurement object *i* is a candidate and not used for RSTD measurement with periodicity Tprs>160ms or with periodicity Tprs=160ms but *prs-MutingInfo-r9* is configured within an arbitrary 1280ms period.

# 9.1.5.2.4 NR-DC: carrier-specific scaling factor for SSB-based measurements performed within gaps

When one or more measurement objects are monitored within measurement gaps, the carrier specific scaling factor for a target measurement object with index i is designated as CSSF<sub>within gap,i</sub> and is derived as described in this clause.

If measurement object *i* refers to an RSTD measurement with periodicity Tprs>160ms or with periodicity Tprs=160ms but *prs-MutingInfo-r9* is configured, CSSF<sub>within\_gap,i</sub>=1. Otherwise, the CSSF<sub>within\_gap,i</sub> for other measurement objects (including RSTD measurement with periodicity Tprs=160ms) participate in the gap competition and the CSSF<sub>within\_gap,i</sub> are derived as below.

For each measurement gap j not used for an RSTD measurement with periodicity Tprs>160ms or with periodicity Tprs=160ms but prs-MutingInfo-r9 is configured within an arbitrary 160ms period, count the total number of intrafrequency measurement objects and inter-frequency/interRAT measurement objects which are candidates to be measured within the gap j.

- An NR measurement object is a candidate to be measured in a gap if its SMTC duration is fully covered by the MGL excluding RF switching time. For intra-frequency NR measurement objects, if the higher layer in TS 38.331 [2] signaling of *smtc2* is configured, the assumed periodicity of SMTC occasions corresponds to the

value of higher layer parameter *smtc2*; otherwise the assumed periodicity of SMTC occasions corresponds to the value of higher layer parameter *smtc1*.

- An inter-RAT measurement object is a candidate to be measured in all meausrement gaps.

For UEs which support and are configured with per FR gaps, the counting is done on a per FR basis, and for UEs which are configured with per UE gaps the counting is done on a per UE basis.

If the number of configured inter-frequency and inter-RAT measuerement objects is non-zero and the UE is configured with per UE gaps, or if the UE is configured with per FR gaps:

FR1 and FR2 intra-frequency measurement objects belong to group A

Inter-frequency and inter-RAT measurement objects belong to group B

 $M_{groupA,i,j}$ : Sum of the number of FR1 intra-frequency measurement objects  $M_{intra-FR1,i,j}$  and the number of FR2 intra-frequency measurement objects  $M_{intra-FR2,i,j}$  which are candidates to be measured in gap j where the measurement object i is also a candidate. Otherwise  $M_{groupA,i,j}$  equals 0.

 $M_{groupBi,j}$ : Number of NR inter-frequency and EUTRA inter-RAT measurement objects which are candidates to be measured in gap j where the measurement object i is also a candidate. Otherwise  $M_{groupB,i,j}$  equals 0.

If the number of configured inter-frequency and inter-RAT measurement objects is zero and the UE is configured with per UE gaps:

FR1 intra-frequency measurement objects belong to group A

FR2 intra-frequency measurement objects belong to group B

 $M_{groupA,i,j}$ : The number of FR1 intra-frequency measurement objects  $M_{intra-FR1,i,j}$  which are candidates to be measured in gap j where the measurement object i is also a candidate. Otherwise  $M_{groupA,i,j}$  equals 0.

 $M_{groupBi,j}$ : The number of FR2 intra-frequency measurement objects  $M_{intra-FR2,i,j}$  which are candidates to be measured in gap j where the measurement object i is also a candidate. Otherwise  $M_{groupB,i,j}$  equals 0.

 $M_{\text{tot,i,j}} = M_{\text{groupA,i,j}} + M_{\text{groupB,i,j}}$ : Total number of group A and group B measurement objects which are candidates to be measured in gap j where the measurement object i is also a candidate. Otherwise  $M_{\text{tot,i,j}}$  equals 0.

For each measurement gap j used for an RSTD measurement with periodicity Tprs>160ms or with periodicity Tprs=160ms but prs-MutingInfo-r9 is configured within an arbitrary 160ms period,  $M_{intra,i,j} = M_{inter,i,j} = M_{tot,i,j} = 0$ .

The carrier specific scaling factor CSSF<sub>within\_gap,i</sub> is given by:

If measGapSharingScheme is equal sharing, CSSF<sub>within\_gap,i</sub>= max(ceil(R<sub>i</sub>×M<sub>tot,i,j</sub>)), where j=0...(160/MGRP)-1

If measGapSharingScheme is not equal sharing and

- measurement object i is a group A measurement object, CSSF<sub>within gap,i</sub> is the maximum among
  - $ceil(R_i \times K_{intra} \times M_{groupA,i,j})$  in gaps where  $M_{groupB,i,j} \neq 0$ , where j=0...(160/MGRP)-1
  - ceil(R<sub>i</sub>×M<sub>groupA,i,j</sub>) in gaps where M<sub>groupB,i,j</sub>=0, where j=0...(160/MGRP)-1
- measurement object i is an group B measurement object, CSSF<sub>within gap,i</sub> is the maximum among
  - ceil( $R_i \times K_{inter} \times M_{groupBi,j}$ ) in gaps where  $M_{groupA,i,j} \neq 0$ , where j=0...(160/MGRP)-1
  - ceil( $R_i \times M_{groupB,i,j}$ ) in gaps where  $M_{groupA,i,j}=0$ , where j=0...(160/MGRP)-1
- R<sub>i</sub> is the maximal ratio of the number of measurement gap where measurement object *i* is a candidate to be measured over the number of measurement gap where measurement object *i* is a candidate and not used for RSTD measurement with periodicity Tprs>160ms or with periodicity Tprs=160ms but *prs-MutingInfo-r9* is configured within an arbitrary 1280ms period.

## 9.1.6 Minimum requirement at transitions

When the measurement on one intra-frequency measurement object transitions from measurements performed outside gaps to measurements performed within gaps or vice versa during one measurement period, the cell identification and measurement period requirements with the longer delay apply.

The carrier-specific scaling factor specified in clause 9.1.5 that applies to the other impacted measurement objects will also apply based on the longer measurement or cell identification delay before or after the transition.

When the UE transitions between DRX and non-DRX or when DRX cycle periodicity changes, the cell identification and measurement period requirements apply based on the longer delay before or after the transition.

Subsequent to this measurement period, the cell identification and measurement period requirements on each measurement object are corresponding to the second mode after transition.

# 9.2 NR intra-frequency measurements

## 9.2.1 Introduction

A measurement is defined as a SSB based intra-frequency measurement provided the centre frequency of the SSB of the serving cell indicated for measurement and the centre frequency of the SSB of the neighbour cell are the same, and the subcarrier spacing of the two SSBs are also the same.

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

The UE can perform intra-frequency SSB based measurements without measurement gaps if

- the SSB is completely contained in the active BWP of the UE, or
- the active downlink BWP is initial BWP[3].

For intra-frequency SSB based measurements without measurement gaps, UE may cause scheduling restriction as specified in clause 9.2.5.3.

SSB based measurements are configured along with one or two measurement timing configuration(s) (SMTC(s)) which provides periodicity, duration and offset information on a window of up to 5ms where the measurements are to be performed. For intra-frequency connected mode measurements, up to two measurement window periodicities may be configured. A single measurement window offset and measurement duration are configured per intra-frequency measurement object.

When measurement gaps are needed, the UE is not expected to detect SSB which start earlier than the gap starting time + switching time, nor detect SSB which end later than the gap end – switching time. Switching time is 0.5ms for frequency range FR1 and 0.25ms for frequency range FR2.

# 9.2.2 Requirements applicability

The requirements in clause 9.2 apply, provided:

- The cell being identified or measured is detectable.

An intra-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in clauses 10.1.2 and 10.1.3 for FR1 and FR2, respectively, for a
  corresponding Band,
- SS-RSRQ related side conditions given in clauses 10.1.7 and 10.1.8 for FR1 and FR2, respectively, for a corresponding Band,
- SS-SINR related side conditions given in clauses 10.1.12 and 10.1.13 for FR1 and FR2, respectively, for a corresponding Band,

- SSB RP and SSB Ês/Iot according to Annex B.2.2 for a corresponding Band.

## 9.2.3 Number of cells and number of SSB

## 9.2.3.1 Requirements for FR1

For each intra-frequency layer, during each layer 1 measurement period, the UE shall be capable of performing SS-RSRP, SS-RSRQ, and SS-SINR measurements for at least:

- 8 identified cells, and
- 14 SSBs with different SSB index and/or PCI on the intra-frequency layer, where the number of SSBs in the serving cell (except for the SCell) is not smaller than the number of configured RLM-RS SSB resources.

## 9.2.3.2 Requirements for FR2

For each intra-frequency layer, during each layer 1 measurement period, the UE shall be capable of performing SS-RSRP, SS-RSRQ, and SS-SINR measurements for at least:

- 6 identified cells, and
- 24 SSBs with different SSB index and/or PCI,

where the single serving carrier shall be:

- PCC when UE is configured with SA NR operation mode with PCC in the band; or
- PSCC when UE is configured with EN-DC with PSCC in the band; or
- One of the SCCs on which UE is configured to report SSB based measurements when neither PCC nor PSCC is
  in the same band, so that the selected SCC shall be an SCC where the UE is configured with SS-RSRP
  measurement reporting if such SCC exists, otherwise the selected SCC is determined by UE implementation.

The UE shall also be capable of performing SS-RSRP, SS-RSRQ, and SS-SINR measurements for at least 2 SSBs on serving cell for each of the other serving carrier(s) in the same band.

## 9.2.4 Measurement Reporting Requirements

## 9.2.4.1 Periodic Reporting

Reported RSRP, RSRQ, and RS-SINR measurements contained in periodic measurement reports shall meet the requirements in clauses 10.1.2.1 (RSRP for FR1), 10.1.3.1 (RSRP for FR2), 10.1.7.1 (RSRQ for FR1), 10.1.8.1 (RSRQ for FR2), 10.1.12.1 (RS-SINR for FR1) and 10.1.13.1 (RS-SINR for FR2).

## 9.2.4.2 Event-triggered Periodic Reporting

Reported RSRP, RSRQ, and RS-SINR measurements contained in event-triggered periodic measurement reports shall meet the requirements in clauses 10.1.2.1 (RSRP for FR1), 10.1.3.1 (RSRP for FR2), 10.1.7.1 (RSRQ for FR1), 10.1.8.1 (RSRQ for FR2), 10.1.12.1 (RS-SINR for FR1) and 10.1.13.1 (RS-SINR for FR2).

The first report in event triggered periodic measurement reporting shall meet the requirements specified in clause 9.2.4.3.

## 9.2.4.3 Event Triggered Reporting

Reported RSRP, RSRQ, and RS-SINR measurements contained in event triggered measurement reports shall meet the requirements in clauses 10.1.2.1 (RSRP for FR1), 10.1.3.1 (RSRP for FR2), 10.1.7.1 (RSRQ for FR1), 10.1.8.1 (RSRQ for FR2), 10.1.12.1 (RS-SINR for FR1) and 10.1.13.1 (RS-SINR for FR2).

The UE shall not send any event triggered measurement reports as long as no reporting criteria is fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is:  $2 \times TTI_{DCCH}$ . This measurement reporting delay excludes a delay which caused by no UL resources being available for UE to send the measurement report on.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than T  $_{identify\ intra\ with\ index}$  or T  $_{identify\ intra\ without\ index}$  defined in clause 9.2.5.1 or clause 9.2.6.2. When L3 filtering is used an additional delay can be expected.

A cell is detectable only if at least one SSBs measured from the Cell being configured remains detectable during the time period T  $_{identify\_intra\_with\_index}$  or T  $_{identify\_intra\_with\_index}$  as defined in clause 9.2.5.1 or clause 9.2.6.2. If a cell which has been detectable at least for the time period T  $_{identify\_intra\_with\_out\_index}$  or T  $_{identify\_intra\_with\_index}$  defined in clause 9.2.5.1 or clause 9.2.6.2 becomes undetectable for a period and then the cell becomes detectable again with the same spatial reception parameter and triggers an event, the event triggered measurement reporting delay shall be less than  $T_{SSB\_measurement\_period\_intra}$  provided the timing to that cell has not changed more than  $\pm$  3200 Tc while the measurement gap has not been available and L3 filtering has not been used. When L3 filtering is used, an additional delay can be expected.

## 9.2.5 Intrafrequency measurements without measurement gaps

## 9.2.5.1 Intrafrequency cell identification

The UE shall be able to identify a new detectable intra frequency cell within T<sub>identify\_intra\_without\_index</sub> if UE is not indicated to report SSB based RRM measurement result with the associated SSB index(reportQuantityRsIndexes or maxNrofRSIndexesToReport is not configured), or the UE is indicated that the neighbour cell is synchronous with the serving cell (deriveSSB-IndexFromCell is enabled). Otherwise UE shall be able to identify a new detectable intra frequency cell within T<sub>identify\_intra\_with\_index</sub>. The UE shall be able to identify a new detectable intra frequency SS block of an already detected cell within T<sub>identify\_intra\_without\_index</sub>. It is assumed that deriveSSB-IndexFromCell is always enabled for FR1 TDD and FR2.

$$T_{identify\_intra\_without\_index} = (T_{PSS/SSS\_sync\_intra} + T_{SSB\_measurement\_period\_intra}) \ ms$$
 
$$T_{identify\_intra\_with\_index} = (T_{PSS/SSS\_sync\_intra} + T_{SSB\_measurement\_period\_intra} + T_{SSB\_time\_index\_intra}) \ ms$$

#### Where:

T<sub>PSS/SSS\_sync\_intra</sub>: it is the time period used in PSS/SSS detection given in table 9.2.5.1-1, 9.2.5.1-2, 9.2.5.1-4 (deactivated Scell) or 9.2.5.1-5 (deactivated SCell)

 $T_{SSB\_time\_index\_intra}$ : it is the time period used to acquire the index of the SSB being measured given in table 9.2.5.1-3 or 9.2.5.1-6 (deactivated SCell)

T<sub>SSB\_measurement\_period\_intra</sub>: equal to a measurement period of SSB based measurement given in table 9.2.5.2-1, table 9.2.5.2-2 table 9.2.5.2-3 (deactivated Scell) or 9.2.5.2-4(deactivated SCell)

CSSF<sub>intra</sub>: it is a carrier specific scaling factor and is determined

according to CSSF<sub>outside\_gap,i</sub> in clause 9.1.5.1 for measurement conducted outside measurement gaps, i.e. when intrafrequency SMTC is fully non overlapping or partially overlapping with measurement gaps, or according to CSSF<sub>within\_gap,i</sub> in clause 9.1.5.2 for measurement conducted within measurement gaps, i.e. when intrafrequency SMTC is fully overlapping with measurement gaps.

if the high layer in TS 38.331 [2] signalling of *smtc2* is configured, the assumed periodicity of intrafrequency SMTC occasions corresponds to the value of higher layer parameter *smtc2*; Otherwise the assumed periodicity of intrafrequency SMTC occasions corresponds to the value of higher layer parameter *smtc1*.

 $M_{pss/sss\_sync\_w/o\_gaps}$ : For a UE supporting FR2 power class 1,  $M_{pss/sss\_sync\_w/o\_gaps}$ =40. For a UE supporting power class 2,  $M_{pss/sss\_sync\_w/o\_gaps}$ =24. For a UE supporting FR2 power class 3,  $M_{pss/sss\_sync\_w/o\_gaps}$ =24. For a UE supporting FR2 power class 4,  $M_{pss/sss\_sync\_w/o\_gaps}$ =24. For a UE supporting FR2 power class 4,  $M_{pss/sss\_sync\_w/o\_gaps}$ =24.

 $M_{meas\_period\_w/o\_gaps}$ : For a UE supporting power class 1,  $M_{meas\_period\_w/o\_gaps}$  =40. For a UE supporting FR2 power class 2,  $M_{meas\_period\_w/o\_gaps}$  =24. For a UE supporting power class 3,  $M_{meas\_period\_w/o\_gaps}$  =24. For a UE supporting power class 4,  $M_{meas\_period\_w/o\_gaps}$  =24.

When intrafrequency SMTC is fully non overlapping with measurement gaps or intrafrequency SMTC is fully overlapping with MGs, Kp=1

When intrafrequency SMTC is partially overlapping with measurement gaps, Kp = 1/(1 - (SMTC period / MGRP)), where SMTC period < MGRP

If the higher layer signaling in TS38.331 [2] signalling of smtc2 is present and smtc1 is fully overlapping with measurement gaps and smtc2 is partially overlapping with measurement gaps, requirements are not specified for  $T_{identify\ intra\ with\ index}$  or  $T_{identify\ intra\ with\ index}$ 

For FR2,

K<sub>layer1 measurement</sub>=1,

- if all of the reference signals configured for RLM, BFD, CBD or L1-RSRP for beam reporting outside measurement gap are not fully overlapped by intra-frequency SMTC occasions, or
- if all of the reference signal configured for RLM, BFD, CBD or L1-RSRP for beam reporting outside
  measurement gap and fully-overlapped by intra-frequency SMTC occasions are not overlapped by with
  the SSB symbols indicated by SSB-ToMeasure and 1 symbol before each consecutive SSB symbols
  indicated by SSB-ToMeasure and 1 symbol after each consecutive SSB symbols indicated by SSBToMeasure, given that SSB-ToMeasure is configured;

K<sub>laver1 measurement</sub>=1.5, otherwise.

If SCG DRX is in use, intrafrequency cell identification requirements specified in Table 9.2.5.1-1, Table 9.2.5.1-2, Table 9.2.5.1-3, Table 9.2.5.1-4, Table 9.2.5.1-5 and Table 9.2.5.1-6 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

Table 9.2.5.1-1: Time period for PSS/SSS detection, (Frequency range FR1)

DRX cycle	T <sub>PSS/SSS_sync_intra</sub>			
No DRX	max( 600ms, ceil( 5 x K <sub>p</sub> ) x SMTC period ) <sup>Note 1</sup> x			
	CSSF <sub>intra</sub>			
DRX cycle≤ 320ms	max( 600ms, ceil(1.5x 5 x K <sub>p</sub> ) x max(SMTC			
·	period,DRX cycle)) x CSSF <sub>intra</sub>			
DRX cycle>320ms	ceil(5] x K <sub>p</sub> ) x DRX cycle x CSSF <sub>intra</sub>			
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is				
the one used by the cell being identified				

Table 9.2.5.1-2: Time period for PSS/SSS detection, (Frequency range FR2)

DRX cycle	T <sub>PSS/SSS_sync_intra</sub>		
No DRX	max(600ms, ceil(M <sub>pss/sss_sync_w/o_gaps</sub> x K <sub>p</sub> x		
	K <sub>layer1 measurement</sub> ) x SMTC period) <sup>Note 1</sup> x CSSF <sub>intra</sub>		
DRX cycle≤ 320ms	max(600ms, ceil(1.5 x M <sub>pss/sss_sync_w/o_gaps</sub> x K <sub>p</sub> x		
	K <sub>layer1 measurement</sub> ) x max(SMTC period,DRX cycle)) x		
	CSSF <sub>intra</sub>		
DRX cycle>320ms	ceil(Mpss/sss_sync_w/o_gaps x Kp x Klayer1 measurement) x DRX		
	cycle x CSSF <sub>intra</sub>		
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement i			
the one used by the cell being identified			

Table 9.2.5.1-3: Time period for time index detection (Frequency range FR1)

DRX cycle	T <sub>SSB_time_index_intra</sub>			
No DRX	max(120ms, ceil( 3 x K <sub>p</sub> ) x SMTC period) <sup>Note 1</sup> x			
	CSSF <sub>intra</sub>			
DRX cycle≤ 320ms	max(120ms, ceil (1.5 x 3 x K <sub>p</sub> ) x max(SMTC			
•	period,DRX cycle)) x CSSF <sub>intra</sub>			
DRX cycle>320ms	Ceil(3 x K <sub>p</sub> ) x DRX cycle x CSSF <sub>intra</sub>			
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is				
the one used by the cell being identified				

Table 9.2.5.1-4: Time period for PSS/SSS detection, deactivated SCell (Frequency range FR1)

DRX cycle	T <sub>PSS/SSS_sync intra</sub>
No DRX	5 x measCycleSCell x CSSF <sub>intra</sub>
DRX cycle≤ 320ms	5 x max(measCycleSCell, 1.5xDRX cycle) x CSSF <sub>intra</sub>
DRX cycle> 320ms	5 x max(measCycleSCell, DRX cycle) x CSSF <sub>intra</sub>

Table 9.2.5.1-5: Time period for PSS/SSS detection, deactivated SCell (Frequency range FR2)

DRX cycle	Tpss/sss_sync_intra
No DRX	Mpss/sss_sync_w/o_gaps x measCycleSCell x CSSFintra
DRX cycle≤ 320ms	M <sub>pss/sss_sync_w/o_gaps</sub> x max(measCycleSCell, 1.5xDRX cycle) x CSSF <sub>intra</sub>
DRX cycle> 320ms	M <sub>pss/sss_sync_w/o_gaps</sub> x max(measCycleSCell, DRX cycle) x CSSF <sub>intra</sub>

Table 9.2.5.1-6: Time period for time index detection, deactivated SCell (Frequency range FR1)

DRX cycle	T <sub>SSB_time_index_intra</sub>
No DRX	3 x measCycleSCell x CSSF <sub>intra</sub>
DRX cycle≤ 320ms	3 x max(measCycleSCell, 1.5xDRX cycle) x CSSF <sub>intra</sub>
DRX cycle> 320ms	3 x max(measCycleSCell, DRX cycle) x CSSF <sub>intra</sub>

Table 9.2.5.1-7: Void

Table 9.2.5.1-8: Void

## 9.2.5.2 Measurement period

The measurement period for intrafrequency measurements without gaps is as shown in table 9.2.5.2-1, 9.2.5.2-2, 9.2.5.2-3 (deactivated SCell) or 9.2.5.2-4(deactivated SCell). If the higher layer signaling in TS38.331 [2] signalling of *smtc2* is present and smtc1 is fully overlapping with measurement and smtc2 is partially overlapping with measurement gaps, requirements are not specified for TSSB\_measurement\_period\_intra

If SCG DRX is in use, intrafrequency measurement period requirements specified in Table 9.2.5.2-1, Table 9.2.5.2-2, Table 9.2.5.2-3 and Table 9.2.5.2-4 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

Table 9.2.5.2-1: Measurement period for intrafrequency measurements without gaps(Frequency FR1)

DRX cycle	T SSB_measurement_period_intra
No DRX	max(200ms, ceil( 5 x K <sub>p</sub> ) x SMTC period) <sup>Note 1</sup> x
	CSSF <sub>intra</sub>
DRX cycle≤ 320ms	max(200ms, ceil(1.5x 5 x K <sub>p</sub> ) x max(SMTC period,DRX
•	cycle)) x CSSF <sub>intra</sub>
DRX cycle>320ms	ceil( 5 x K <sub>p</sub> ) x DRX cycle x CSSF <sub>intra</sub>
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is	
the one used by the cell being identified	

Table 9.2.5.2-2: Measurement period for intrafrequency measurements without gaps(Frequency FR2)

DRX cycle	T SSB_measurement_period_intra
No DRX	max(400ms, ceil(M <sub>meas_period_w/o_gaps</sub> x K <sub>p</sub> x
	K <sub>layer1 measurement</sub> ) x SMTC period) <sup>Note 1</sup> x CSSF <sub>intra</sub>
DRX cycle≤ 320ms	max(400ms, ceil(1.5x M <sub>meas_period_w/o_gaps</sub> x K <sub>p</sub> x
	K <sub>layer1 measurement</sub> ) x max(SMTC period,DRX cycle)) x
	CSSF <sub>intra</sub>
DRX cycle>320ms	ceil(M <sub>meas_period_w/o_gaps</sub> xK <sub>p</sub> x K <sub>layer1 measurement</sub> ) x DRX
	cycle x CSSF <sub>intra</sub>
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is	
the one used by the cell being identifie	ed

Table 9.2.5.2-3: Measurement period for intrafrequency measurements without gaps (deactivated SCell) (Frequency range FR1)

DRX cycle	T ssb_measurement_period_intra
No DRX	5 x measCycleSCell x CSSF <sub>intra</sub>
DRX cycle≤ 320ms	5 x max(measCycleSCell, 1.5xDRX cycle) x CSSF <sub>intra</sub>
DRX cycle> 320ms	5 x max(measCycleSCell, DRX cycle) x CSSF <sub>intra</sub>

Table 9.2.5.2-4: Measurement period for intrafrequency measurements without gaps (deactivated SCell) (Frequency range FR2)

DRX cycle	T SSB_measurement_period_intra
No DRX	M <sub>meas_period_w/o_gaps</sub> x measCycleSCell x CSSF <sub>intra</sub>
DRX cycle≤ 320ms	M <sub>meas_period_w/o_gaps</sub> x max(measCycleSCell, 1.5xDRX cycle) x CSSF <sub>intra</sub>
DRX cycle> 320ms	M <sub>meas_period_w/o_gaps</sub> x max(measCycleSCell, DRX cycle) x CSSF <sub>intra</sub>

## 9.2.5.3 Scheduling availability of UE during intra-frequency measurements

UE are required to be capable of measuring without measurement gaps when the SSB is completely contained in the active bandwidth part of the UE. When any of the conditions in the following clauses is met, there are restrictions on the scheduling availability; otherwise, there is no scheduling restriction. Note that the SSB symbols to be measured in the following clauses are the SSB symbols indicated by *SSB-ToMeasure* [2], if it is configured; otherwise, all *L* SSB symbols within SMTC window duration defined in clause 4.1 of TS 38.213 [3] are included.

#### 9.2.5.3.1 Scheduling availability of UE performing measurements in TDD bands on FR1

When the UE performs intra-frequency measurements in a TDD band, the following restrictions apply due to SS-RSRP or SS-SINR measurement

- The UE is not expected to transmit PUCCH/PUSCH/SRS on SSB symbols to be measured, and on 1 data symbol before each consecutive SSB symbols to be measured and 1 data symbol after each consecutive SSB symbols to be measured within SMTC window duration. If the high layer in TS 38.331 [2] signalling of *smtc2* is configured, the SMTC periodicity follows *smtc2*; Otherwise SMTC periodicity follows *smtc1*.

When the UE performs intra-frequency measurements in a TDD band, the following restrictions apply due to SS-RSRQ measurement

- The UE is not expected to transmit PUCCH/PUSCH/SRS on SSB symbols to be measured, RSSI measurement symbols, and on 1 data symbol before each consecutive SSB to be measured/RSSI symbols and 1 data symbol after each consecutive SSB to be measured/RSSI symbols within SMTC window duration. If the high layer signalling of *smtc2* is configured(in TS 38.331 [2]), the SMTC periodicity follows *smtc2*; Otherwise the SMTC periodicity follows *smtc1* 

When TDD intra-band carrier aggregation is performed, the scheduling restrictions due to a given serving cell should also apply to all other serving cells in the same band on the symbols that fully or partially overlap with aforementioned restricted symbols.

# 9.2.5.3.2 Scheduling availability of UE performing measurements with a different subcarrier spacing than PDSCH/PDCCH on FR1

For UE which do not support *simultaneousRxDataSSB-DiffNumerology* [14] the following restrictions apply due to SS-RSRP/RSRQ/SINR measurement

- If *deriveSSB\_IndexFromCell* is enabled the UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on SSB symbols to be measured, and on 1 data symbol before each consecutive SSB symbols to be measured and 1 data symbol after each consecutive SSB symbols to be measured within SMTC window duration. If the high layer signalling of *smtc2* is configured(in TS 38.331 [2]), the SMTC periodicity follows *smtc2*; Otherwise the SMTC periodicity follows *smtc1*.
- If deriveSSB\_IndexFromCell is not enabled the UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on all symbols within SMTC window duration. If the high layer signalling of smtc2 is configured(in TS 38.331 [2]), the SMTC periodicity follows smtc2; Otherwise the SMTC periodicity follows smtc1.

When intra-band carrier aggregation is performed, the scheduling restrictions due to a given serving cell should also apply to all other serving cells in the same band on the symbols that fully or partially overlap with aforementioned restricted symbols.

#### 9.2.5.3.3 Scheduling availability of UE performing measurements on FR2

The following scheduling restriction applies due to SS-RSRP or SS-SINR measurement on an FR2 intra-frequency cell

The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on SSB symbols to be measured, and on 1 data symbol before each consecutive SSB symbols to be measured and 1 data symbol after each consecutive SSB symbols to be measured within SMTC window duration (The signaling deriveSSB\_IndexFromCell is always enabled for FR2). If the high layer signalling of smtc2 is configured(in TS 38.331 [2]), the SMTC periodicity follows smtc2; Otherwise the SMTC periodicity follows smtc1.

The following scheduling restriction applies to SS-RSRQ measurement on an FR2 intra-frequency cell

- The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on SSB symbols to be measured, RSSI measurement symbols, and on 1 data symbol before each consecutive SSB to be measured/RSSI symbols and 1 data symbol after each consecutive SSB to be measured/RSSI symbols within SMTC window duration (The signaling *deriveSSB\_IndexFromCellc* is always enabled for FR2). If the high layer signalling of *smtc2* is configured(in TS 38.331 [2]), the SMTC periodicity follows *smtc2*; Otherwise the SMTC periodicity follows *smtc1*.

When intra-band carrier aggregation is performed, the scheduling restrictions due to a given serving cell should also apply to all other serving cells in the same band on the symbols that fully or partially overlap with aforementioned restricted symbols.

If following conditions are met:

- · The UE has been notified about system information update through paging,
- The gap between the UE's reception of PDCCH that UE monitors in the Type 2-PDCCH CSS set that notifies system information update, and the PDCCH that UE monitors in the Type0-PDCCH CSS set, is greater than 2 slots,

For the SSB and CORESET for RMSI scheduling multiplexing patterns 3, the UE is expected to receive the PDCCH that the UE monitors in the Type0-PDCCH CSS set, and the corresponding PDSCH, on SSB symbols to be measured; and

For the SSB and CORESET for RMSI scheduling multiplexing patterns 2, the UE is expected to receive PDSCH that corresponds to the PDCCH that the UE monitors in the Type0-PDCCH CSS set, on SSB symbols to be measured.

# 9.2.5.3.4 Scheduling availability of UE performing measurements on FR1 or FR2 in case of FR1-FR2 inter-band CA

There are no scheduling restrictions on FR1 serving cell(s) due to measurements performed on FR2 serving cell frequency layer.

There are no scheduling restrictions on FR2 serving cell(s) due to measurements performed on FR1 serving cell frequency layer.

#### 9.2.5.4 SFTD Measurements between PCell and PSCell

#### 9.2.5.4.1 Introduction

This clause contains SFTD measurement requirements for UE which supports NR-DC and is configured with a PSCell in RRC\_CONNECTED state. The UE shall perform SFTD measurement between PCell and PSCell, and report the SFTD result with/without SS-RSRP after the network requests with *reportType* for the associated *reportConfig* set to *reportSFTD*. The overall delay includes RRC procedure delay to be defined in clause 12 in TS 38.331 [2], and SFTD measurement reporting delay in clause 9.2.5.4.3.

## 9.2.5.4.2 SFTD Measurement delay

When no DRX is used in either of PCell and PSCell, the physical layer measurement period of the SFTD measurement shall be  $T_{measure\_SFTD1} = max(200,[5] \times SMTC \text{ period})$  ms, where the SMTC period refers to the maximum between the configured SMTC period in PCell and PSCell.

When DRX is used in either of the PCell or the PSCell, or in both PCell and PSCell, the physical layer measurement period ( $T_{measure\ SFTD1}$ ) of the SFTD measurement shall be as specified in Table 9.2.5.4.2-1.

Table 9.2.5.4.2-1: SFTD measurement requirement when DRX is used

DRX cycle length (s) Note 3	T <sub>measure_SFTD1</sub> (s)
≤0.04	max(0.2,[5] x SMTC period) (Note2)
0.04 <drx cycle≤0.32<="" td=""><td>8 x max(DRX cycle, SMTC period)</td></drx>	8 x max(DRX cycle, SMTC period)
0.32 <drx cycle≤10.24<="" td=""><td>5 x DRX cycle</td></drx>	5 x DRX cycle
configured SMTC period in Note 2: Number of DRX cycles deponded in this table configured for PCell or PSC	ends upon the DRX cycle in use le refers to the DRX cycle length cell. When DRX is used in both PCell and this table refers to the longer of the DRX

If PSCell is changed without changing carrier frequency of PSCell, while the UE is performing SFTD measurements, the UE shall still meet SFTD measurement and accuracy requirements for the new PSCell. In this case the UE shall restart the SFTD measurement, and the total physical layer measurement period shall not exceed  $T_{measure\_SFTD2}$  as defined by the following expression:

$$T_{measure\_SFTD2} = (M+1)*(T_{measure\_SFTD1}) + M*T_{PSCell\_change\_NRDC}$$

where:

M is the number of times the NR PSCell is changed over the measurement period (T<sub>measure SFTD2</sub>), and

T<sub>PSCell change NRDC</sub> is the time necessary to change the PSCell; it can be up to [25] ms.

If PCell is changed, or if PSCell is changed with different carrier frequency from PSCell, the UE shall terminate SFTD measurements.

The measurement accuracy for the SFTD measurement when DRX is used as well as when no DRX is used shall be as specified in the sub-clause 10.1.21.

## 9.2.5.4.3 SFTD Measurement Reporting Delay

The SFTD measurement reporting delay is defined as the time between a command that will trigger an SFTD measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is:  $2 \times TTI_{DCCH}$ . This measurement reporting delay excludes any delay caused by no UL resources available for UE to send the measurement report.

The SFTD measurement reporting delay shall be less than measurement period defined in clause 9.2.5.4.2 plus the RRC procedure delay defined in TS 38.331 [2].

## 9.2.6 Intrafrequency measurements with measurement gaps

#### 9.2.6.1 Void

## 9.2.6.2 Intrafrequency cell identification

The UE shall be able to identify a new detectable intra frequency cell within T<sub>identify\_intra\_without\_index</sub> if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRsIndexesToReport* is not configured), or the UE has been indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). Otherwise UE shall be able to identify a new detectable intra frequency cell within T<sub>identify\_intra\_with\_index</sub>. The UE shall be able to identify a new detectable intra frequency SS block of an already detected cell within T<sub>identify\_intra\_without\_index</sub>. It is assumed that *deriveSSB-IndexFromCell* is always enabled for FR1 TDD and FR2.

$$T_{identify\_intra\_without\_index} = T_{PSS/SSS\_sync\_intra} + T_{SSB\_measurement\_period\_intra} \quad ms$$
 
$$T_{identify\_intra\_with\_index} = T_{PSS/SSS\_sync\_intra} + T_{SSB\_measurement\_period\_intra} + T_{SSB\_time\_index\_intra}$$

#### Where:

T<sub>PSS/SSS sync intra</sub>: it is the time period used in PSS/SSS detection given in table 9.2.6.2-1 or 9.2.6.2-2.

 $T_{SSB\_time\_index\_intra}$ : it is the time period used to acquire the index of the SSB being measured given in table 9.2.6.2-3.

 $T_{SSB\_measurement\_period\_intra}$ : equal to a measurement period of SSB based measurement given in table 9.2.6.2-1 or 9.2.6.2-2.

CSSF<sub>intra</sub>: it is a carrier specific scaling factor and is determined according to CSSF<sub>within\_gap,i</sub> in clause 9.1.5.2 for measurement conducted within measurement gaps.

 $M_{pss/sss\_sync\_with\_gaps}$ : For a UE supporting FR2 power class 1,  $M_{pss/sss\_sync\_with\_gaps}$ =40. For a UE supporting FR2 power class 2,  $M_{pss/sss\_sync\_with\_gaps}$ =24. For a UE supporting FR2 power class 3,  $M_{pss/sss\_sync\_with\_gaps}$ =24. For a UE supporting power class 4,  $M_{pss/sss\_sync\_with\_gaps}$ =24.

 $M_{meas\_period\_with\_gaps}$ : For a UE supporting power class 1,  $M_{meas\_period\_with\_gaps}$  =40. For a UE supporting power class 2,  $M_{meas\_period\_with\_gaps}$  =24. For a UE supporting power class 3,  $M_{meas\_period\_with\_gaps}$  =24. For a UE supporting power class 4,  $M_{meas\_period\_with\_gaps}$  =24.

If the higher layer signaling in TS 38.331 [2] signaling of smtc2 is present and smtc1 is fully overlapping with measurement gaps and smtc2 is partially overlapping with measurement gaps, requirements are not specified for  $T_{identify\_intra\_with\_index}$  or  $T_{identify\_intra\_with\_index}$ .

If SCG DRX is in use, intrafrequency cell identification requirements specified in Table 9.2.6.2-1, Table 9.2.6.2-2, and Table 9.2.6.2-3 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

Table 9.2.6.2-1: Time period for PSS/SSS detection (Frequency range FR1)

DRX cycle	Tpss/sss_sync_intra
No DRX	max(600ms, 5 x max(MGRP, SMTC period)) x
	CSSF <sub>intra</sub>
DRX cycle≤ 320ms	max(600ms, ceil(1.5x 5) x max(MGRP, SMTC
,	period,DRX cycle)) x CSSF <sub>intra</sub>
DRX cycle>320ms	5 x max(MGRP, DRX cycle) x CSSF <sub>intra</sub>

Table 9.2.6.2-2: Time period for PSS/SSS detection (Frequency range FR2)

DRX cycle	TPSS/SSS_sync_intra
No DRX	max(600ms, M <sub>pss/sss_sync_with_gaps</sub> x max(MGRP, SMTC
	period)) x CSSF <sub>intra</sub>
DRX cycle≤ 320ms	max(600ms, ceil(1.5x M <sub>pss/sss_sync_with_gaps</sub> ) x
•	max(MGRP, SMTC period, DRX cycle)) x CSSF <sub>intra</sub>
DRX cycle>320ms	M <sub>pss/sss_sync_with_gaps</sub> x max(MGRP, DRX cycle) x
·	CSSF <sub>intra</sub>

Table 9.2.6.2-3: Time period for time index detection (Frequency range FR1)

DRX cycle	T <sub>SSB_time_index_intra</sub>
No DRX	max(120ms, 3 x max(MGRP, SMTC period)) x
	CSSF <sub>intra</sub>
DRX cycle≤ 320ms	max(120ms, ceil(1.5x 3) x max(MGRP, SMTC
	period,DRX cycle) x CSSF <sub>intra</sub> )
DRX cycle>320ms	3 x max(MGRP, DRX cycle) x CSSF <sub>intra</sub>

Table 9.2.6.2-7: Void

Table 9.2.6.2-8: Void

## 9.2.6.3 Intrafrequency Measurement Period

The measurement period for FR1 intrafrequency measurements with gaps is as shown in table 9.2.6.3-1.

The measurement period for FR2 intrafrequency measurements with gaps is as shown in table 9.2.6.3-2.

If SCG DRX is in use, intrafrequency measurement period requirements specified in Table 9.2.6.3-1 and Table 9.2.6.3-2, shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

Table 9.2.6.3-1: Measurement period for intrafrequency measurements with gaps(Frequency Range FR1)

DRX cycle	T SSB_measurement_period_intra
No DRX	max(200ms, 5 x max(MGRP, SMTC period)) x
	CSSF <sub>intra</sub>
DRX cycle≤ 320ms	max(200ms, ceil(1.5x 5) x max(MGRP, SMTC
,	period,DRX cycle)) x CSSF <sub>intra</sub>
DRX cvcle>320ms	5 x max(MGRP, DRX cycle) x CSSF <sub>intra</sub>

Table 9.2.6.3-2: Measurement period for intrafrequency measurements with gaps(Frequency Range FR2)

DRX cycle	T <sub>SSB_measurement_period_intra</sub>
No DRX	max(400ms, M <sub>meas_period with_gaps</sub> x max(MGRP, SMTC
	period)) x CSSF <sub>intra</sub>
DRX cycle≤ 320ms	max(400ms, ceil(1.5 x M <sub>meas_period with_gaps</sub> ) x max(MGRP, SMTC period, DRX cycle)) Note 1 x CSSF <sub>intra</sub>
DRX cycle>320ms	M <sub>meas_period with_gaps</sub> x max(MGRP, DRX cycle) x CSSF <sub>intra</sub>

# 9.3 NR inter-frequency measurements

## 9.3.1 Introduction

A measurement is defined as an SSB based inter-frequency measurement provided it is not defined as an intra-frequency measurement according to clause 9.2.

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

SSB based measurements are configured along with a measurement timing configuration (SMTC) per carrier, which provides periodicity, duration and offset information on a window of up to 5ms where the measurements on the configured inter-frequency carrier are to be performed. For inter-frequency connected mode measurements, one measurement window periodicity may be configured per inter-frequency measurement object.

When measurement gaps are needed, the UE is not expected to detect SSB on an inter-frequency measurement object which starts earlier than the gap starting time + switching time, nor detect SSB which ends later than the gap end – switching time. When the inter-frequency cells are in FR2 and the per-FR gap is configured to the UE in EN-DC, SA NR, NE-DC and NR-DC, or the serving cells are in FR2, the inter-frequency cells are in FR2 and the per-UE gap is configured to the UE in SA NR and NR-DC, the switching time is 0.5ms.

## 9.3.2 Requirements applicability

The requirements in clause 9.3 apply, provided:

- The cell being identified or measured is detectable.

An inter-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in clauses 10.1.4 and 10.1.5 for FR1 and FR2, respectively, for a corresponding Band,
- SS-RSRQ related side conditions given in clauses 10.1.9 and 10.1.10 for FR1 and FR2, respectively, for a corresponding Band,
- SS-SINR related side conditions given in clauses 10.1.14 and 10.1.15 for FR1 and FR2, respectively, for a corresponding Band,
- SSB RP and SSB Ês/Iot according to Annex B.2.3 for a corresponding Band.

- 9.3.2.1 Void
- 9.3.2.2 Void

## 9.3.3 Number of cells and number of SSB

## 9.3.3.1 Requirements for FR1

For each inter-frequency layer, during each layer 1 measurement period, the UE shall be capable of performing SS-RSRP, SS-RSRQ, and SS-SINR measurements for at least:

- 4 identified cells, and
- 7 SSBs with different SSB index and/or PCI on the inter-frequency layer.

## 9.3.3.2 Requirements for FR2

For each inter-frequency layer, during each layer 1 measurement period, the UE shall be capable of performing SS-RSRP, SS-RSRQ, and SS-SINR measurements for at least:

- 4 identified cells, and
- 10 SSBs with different SSB index and/or PCI on the inter-frequency layer, and
- 1 SSB per identified cell.

## 9.3.4 Inter frequency cell identification

When measurement gaps are provided, or the UE supports capability of conducting such measurements without gaps, the UE shall be able to identify a new detectable inter frequency cell within T<sub>identify\_inter\_without\_index</sub> if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured). Otherwise UE shall be able to identify a new detectable inter frequency cell within T<sub>identify\_inter\_with\_index</sub>. The UE shall be able to identify a new detectable inter frequency SS block of an already detected cell within T<sub>identify\_inter\_with\_index</sub>.

$$T_{identify\_inter\_without\_index} = (T_{PSS/SSS\_sync\_inter} + T_{SSB\_measurement\_period\_inter}) \ ms$$
 
$$T_{identify\_inter\_with\_index} = (T_{PSS/SSS\_sync\_inter} + T_{SSB\_measurement\_period\_inter} + T_{SSB\_time\_index\_inter}) \ ms$$

Where:

T<sub>PSS/SSS\_sync\_inter</sub>: it is the time period used in PSS/SSS detection given in table 9.3.4-1 and table 9.3.4-2.

 $T_{SSB\_time\_index\_inter}$ : it is the time period used to acquire the index of the SSB being measured given in table 9.3.4-3 and table 9.3.4-4.

 $T_{SSB\_measurement\_period\_inter}$ : equal to a measurement period of SSB based measurement given in table 9.3.5-1 and table 9.3.5-2.

 $M_{pss/sss\_sync\_inter}$ : For a UE supporting FR2 power class 1,  $M_{pss/sss\_sync\_inter} = 64$  samples. For a UE supporting FR2 power class 2,  $M_{pss/sss\_sync\_inter} = 40$  samples. For a UE supporting FR2 power class 3,  $M_{pss/sss\_sync\_inter} = 40$  samples. For a UE supporting FR2 power class 4,  $M_{pss/sss\_sync\_inter} = 40$  samples.

 $M_{SSB\_index\_inter}$ : For a UE supporting FR2 power class 1,  $M_{SSB\_index\_inter} = 40$  samples. For a UE supporting FR2 power class 2,  $M_{SSB\_index\_inter} = 24$  samples. For a UE supporting FR2 power class 3,  $M_{SSB\_index\_inter} = 24$  samples. For a UE supporting FR2 power class 4,  $M_{SSB\_index\_inter} = 24$  samples.

 $M_{meas\_period\_inter}$ : For a UE supporting FR2 power class 1,  $M_{meas\_period\_inter}$  =64 samples. For a UE supporting FR2 power class 2,  $M_{meas\_period\_inter}$  =40 samples. For a UE supporting FR2 power class 3,  $M_{meas\_period\_inter}$  =40 samples. For a UE supporting FR2 power class 4,  $M_{meas\_period\_inter}$  =40 samples.

CSSF<sub>inter</sub>: it is a carrier specific scaling factor and is determined according to CSSF<sub>within\_gap,i</sub> in clause 9.1.5.2 for measurement conducted within measurement gaps.

Table 9.3.4-1: Time period for PSS/SSS detection, (Frequency range FR1)

Condition NOTE1,2	TPSS/SSS_sync_inter	
No DRX	Max(600ms, 8 × Max(MGRP, SMTC period)) × CSSF <sub>inter</sub>	
DRX cycle ≤ 320ms	Max(600ms, Ceil(8*1.5) × Max(MGRP, SMTC period, DRX cycle)) × CSSF <sub>inter</sub>	
DRX cycle > 320ms	8 × DRX cycle × CSSF <sub>inter</sub>	
NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1		
NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for		
the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.		

Table 9.3.4-2: Time period for PSS/SSS detection, (Frequency range FR2)

Condition NOTE1,2	TPSS/SSS_sync_inter	
No DRX	$Max(600ms, M_{pss/sss\_sync\_inter} \times Max(MGRP, SMTC period)) \times CSSF_{inter}$	
DRX cycle ≤ 320ms	Max(600ms, (1.5 × M <sub>pss/sss_sync_inter</sub> ) × Max(MGRP, SMTC period, DRX cycle)) ×	
-	CSSF <sub>inter</sub>	
DRX cycle > 320ms	Mpss/sss sync inter × DRX cycle × CSSFinter	
NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1		
NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for		
the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.		

Table 9.3.4-3: Time period for time index detection (Frequency range FR1)

Condition NOTE1,2	T <sub>SSB_time_index_inter</sub>	
No DRX	Max(120ms, 3 × Max(MGRP, SMTC period)) × CSSF <sub>inter</sub>	
DRX cycle ≤ 320ms	$Max(120ms, Ceil(3 \times 1.5) \times Max(MGRP, SMTC period, DRX cycle)) \times CSSF_{inter}$	
DRX cycle > 320ms	3 × DRX cycle × CSSF <sub>inter</sub>	
NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1		
NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for		
the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.		

Table 9.3.4-4: Time period for time index detection (Frequency range FR2)

Condition NOTE1,2	Tssb_time_index_inter	
No DRX	Max(200ms, M <sub>SSB_index_inter</sub> × Max(MGRP, SMTC period)) × CSSF <sub>inter</sub>	
DRX cycle ≤ 320ms	Max(200ms, (1.5 × MssB_index_inter) × Max(MGRP, SMTC period, DRX cycle)) ×	
	CSSF <sub>inter</sub>	
DRX cycle > 320ms	Mssb index inter × DRX cycle × CSSFinter	
NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1		
NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for		
the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.		

9.3.4.1 Void

Void

9.3.4.2

## 9.3.5 Inter frequency measurements

When measurement gaps are provided for inter frequency measurements, or the UE supports capability of conducting such measurements without gaps, the UE physical layer shall be capable of reporting SS-RSRP, SS-RSRQ and SS-SINR measurements to higher layers with measurement accuracy as specified in sub-clauses 10.1.4, 10.1.5, 10.1.9, 10.1.10, 10.1.14 and 10.1.15, respectively, as shown in table 9.3.5-1 and 9.3.5-2:

Table 9.3.5-1: Measurement period for inter-frequency measurements with gaps (Frequency FR1)

Condition NOTE1,2	T SSB_measurement_period_inter	
No DRX	Max(200ms, 8 × Max(MGRP, SMTC period)) × CSSF <sub>inter</sub>	
DRX cycle ≤ 320ms	Max(200ms, Ceil(8 × 1.5) × Max(MGRP, SMTC period, DRX cycle)) × CSSF <sub>inter</sub>	
DRX cycle > 320ms	8 × DRX cycle × CSSF <sub>inter</sub>	
NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1		
NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for		
the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.		

Table 9.3.5-2: Measurement period for inter-frequency measurements with gaps (Frequency FR2)

Condition NOTE1,2	T SSB_measurement_period_inter
No DRX	Max(400ms, M <sub>meas_period_inter</sub> × Max(MGRP, SMTC period)) × CSSF <sub>inter</sub>
DRX cycle ≤ 320ms	Max(400ms, (1.5 × M <sub>meas_period_inter</sub> ) × Max(MGRP, SMTC period, DRX cycle)) ×
_	CSSF <sub>inter</sub>
DRX cycle > 320ms	$M_{meas\_period\_inter}  imes DRX \ cycle  imes CSSF_{inter}$
NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1	
NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for	
the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.	

9.3.5.1	Void
9.3.5.2	Void
9.3.5.3	Void

## 9.3.6 NR Inter frequency measurements reporting requirements

#### 9.3.6.1 Periodic Reporting

Reported SS-RSRP, SS-RSRQ, and SS-SINR measurements contained in periodically triggered measurement reports shall meet the requirements in clauses 10.1.4.1, 10.1.5.1, 10.1.9.1, 10.1.10.1, 10.1.14.1 and 10.1.15.1, respectively.

## 9.3.6.2 Event-triggered Periodic Reporting

Reported SS-RSRP, SS-RSRQ, and SS-SINR measurements contained in event triggered periodic measurement reports shall meet the requirements in clauses 10.1.4.1, 10.1.5.1, 10.1.9.1, 10.1.10.1, 10.1.14.1 and 10.1.15.1, respectively.

The first report in event triggered periodic measurement reporting shall meet the requirements specified in clause 9.3.6.3.

## 9.3.6.3 Event-triggered Reporting

Reported SS-RSRP, SS-RSRQ, and SS-SINR measurements contained in event triggered measurement reports shall meet the requirements in clauses 10.1.4.1, 10.1.5.1, 10.1.9.1, 10.1.10.1, 10.1.14.1 and 10.1.15.1, respectively.

The UE shall not send any event triggered measurement reports, as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is:  $2 \times TTI_{DCCH}$ . This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be within  $T_{identify\_inter\_without\_index}$  if UE is not indicated to report SSB based RRM measurement result with the associated SSB index. Otherwise UE shall

be able to identify a new detectable inter frequency cell within  $T_{identify\_inter\_with\_index}$ . Both  $T_{identify\_inter\_without\_index}$  and  $T_{identify\_inter\_with\_index}$  are defined in clause 9.3.4. When L3 filtering is used an additional delay can be expected.

A cell is detectable only if at least one SSB measured from the cell being configured remains detectable during the time period  $T_{identify\_inter\_without\_index}$  or  $T_{identify\_inter\_with\_index}$  defined in clause 9.3.4. If a cell which has been detectable at least for the time period  $T_{identify\_inter\_without\_index}$  or  $T_{identify\_inter\_with\_index}$  defined in clause 9.3.4 becomes undetectable for a period and then the cell becomes detectable again with the same spatial reception parameter and then triggers the measurement report as per TS 38.331 [2], the event triggered measurement reporting delay shall be less than  $T_{SSB\_measurement\_period\_inter}$  defined in clause 9.3.5 provided the timing to that cell has not changed more than  $\pm$  3200 Tc while measurement gap has not been available and the L3 filtering has not been used. When L3 filtering is used an additional delay can be expected.

## 9.3.7 Void

## 9.3.8 NR Inter frequency SFTD measurement requirements

## 9.3.8.1 Introduction

This clause contains requirements for a UE supporting NR inter-frequency SFTD measurement and is applicable in RRC\_CONNECTED state. The UE shall, depending on network request, perform inter-frequency SFTD measurement and report SFTD result with or without SS-RSRP. The overall delay includes RRC procedure delay defined in clause 12 in TS 38.331 [2] and SFTD measurement reporting delay in clause 9.3.8.3.

UE which fulfils the requirements in clause 9.3.8 is not supposed to fulfil the requirements defined in clause 9.2.5.4.

## 9.3.8.2 SFTD Measurement delay

The requirements on SFTD measurement delay defined in this clause are applicable under the side condition SCH  $\hat{E}s/Iot \ge -3$  dB for the inter-frequency neighbour cell. Depending on configuration, the SFTD measurement may be carried out with or without the support of configured measurement gaps. In the current release, indication on whether to carry out the SFTD measurement with or without measurement gaps is implicit and depending on whether measurement gaps are configured.

The UE shall be able to detect, identify and measure SFTD of up to 3 of the strongest applicable inter-frequency neighbour cells on the carrier frequency provided in the SFTD measurement configuration. Further depending on the SFTD measurement configuration, the UE shall additionally report SS-RSRP for the one or more strongest cells. The UE may or may not be configured with *cellsForWhichToReportSFTD*. The UE does not expect *cellsForWhichToReportSFTD* to change during an ongoing SFTD measurement.

When no measurement gaps are provided, the UE shall be capable of finding the inter-frequency neighbour cell regardless of its SSB position in the SMTC period, provided that the carrier frequency where SFTD measurement is configured and the serving carrier(s) form a supported CA or NR-DC band combination of the UE. The SFTD measurement shall be conducted with sustained connection to the PCell and activated SCell(s) in MCG. Depending on capability, the UE may be allowed to cause a certain amount of interruptions for reconfiguration of the radio receiver, as specified in clause 8.2.2.2.6.

When measurement gaps are provided, the UE shall be capable of finding the inter-frequency neighbour cell under the additional condition that the SSB at least occasionally falls within the measurement gap.

When no DRX is used, the UE shall be capable of determining SFTD within a physical layer measurement period of  $T_{\text{measure SFTD1}}$  as follows:

- For SFTD measurements without measurement gaps, and without additional SS-RSRP reporting:
  - For carrier frequency in FR1: T<sub>measure SFTD1</sub> = 14 SMTC periods
  - For carrier frequency in FR2:  $T_{measure SFTD1} = 112 SMTC$  periods
- For SFTD measurements in measurement gaps, and without additional SS-RSRP reporting:
  - For carrier frequency in FR1:  $T_{\text{measure SFTD1}} = \text{CSSF}_{\text{inter}} \times 8 \times \text{Max}(\text{MGRP}, \text{SMTC period})$

- For carrier frequency in FR2:  $T_{measure\ SFTD1} = CSSF_{inter} \times 64 \times Max(MGRP, SMTC\ period)$
- For SFTD measurements without measurement gaps, and with additional SS-RSRP reporting:
  - For carrier frequency in FR1: T<sub>measure SFTD1</sub> = 19 SMTC periods
  - For carrier frequency in FR2: T<sub>measure SFTD1</sub> = 152 SMTC periods
- For SFTD measurements in measurement gaps, and with additional SS-RSRP reporting:
  - For carrier frequency in FR1: T<sub>measure SFTD1</sub> = CSSF<sub>inter</sub> × 13 × Max(MGRP, SMTC period)
  - For carrier frequency in FR2:  $T_{measure\ SFTD1} = CSSF_{inter} \times 104 \times Max(MGRP, SMTC\ period)$

where CSSF<sub>inter</sub> is a carrier specific scaling factor and is determined according to CSSF<sub>within\_gap,i</sub> in clause 9.1.5.2 for measurement conducted within measurement gaps.

When DRX is used, the same  $T_{measure\_SFTD1}$  as for non-DRX applies, but the reporting delay depends on the DRX cycle length in use.

In case PCell is changed due to handover, the UE shall terminate the inter-frequency SFTD measurement.

The measurement accuracy for the SFTD measurement shall fulfil the requirement in clause 10.1.21.3. The measurement accuracy for additionally reported SS-RSRP shall fulfil the requirement in clauses 10.1.4.1 and 10.1.5.1 for neighbour cell in FR1 and FR2, respectively.

## 9.3.8.3 SFTD Measurement reporting delay

The SFTD measurement reporting delay is defined as the time between a command that will trigger an SFTD measurement report and the point when the UE starts to transmit the measurement report over the air interface, excluding the RRC procedure delay defined in TS 38.331 [2]. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty of 2  $\times$  TTI<sub>DCCH</sub> resulting when inserting the measurement report to the TTI of the uplink DCCH. This measurement reporting delay excludes any delay caused by lack of UL resources for UE to send the measurement report.

The SFTD measurement reporting delay shall be less than  $T_{measure\ SFTD1}$  defined in clause 9.3.8.2.

## 9.4 Inter-RAT measurements

## 9.4.1 Introduction

The requirements in this clause are specified for NR-E-UTRAN FDD and NR-E-UTRAN TDD measurements and are applicable without an explicit E-UTRAN neighbour cell list containing physical layer cell identities, for a UE:

- in RRC CONNECTED state, and
- configured with SA or NR-DC operation mode or configured in NE-DC operation mode by PCell with NR-E-UTRAN FDD or TDD measurement (RSRP, RSRQ, RS-SINR, RSTD, or E-CID) on E-UTRA non-serving frequency carrier, and
- configured with an appropriate measurement gap pattern according to Table 9.1.2-3.

When the UE is in NE-DC operation mode and an NR-E-UTRAN FDD or TDD measurement (RSRP, RSRQ, RS-SINR, RSTD, or E-CID) configured by NR PCell is on a E-UTRA serving frequency carrier, then the corresponding E-UTRA intra-frequency measurements requirements specified in clause 8.19 of TS 36.133 [15] shall apply.

Parameter T<sub>Inter1</sub> used in inter-RAT requirements in clause 9.4 is specified in Table 9.4.1-1.

Table 9.4.1-1: Minimum available time for inter-RAT measurements

Gap Pattern Id	MeasurementGap Length (MGL, ms)	Measurement Gap Repetition Period (MGRP, ms)	Minimum available time for inter- frequency and inter- RAT measurements during 480 ms period (Tinter1, ms)
0	6	40	60
1	6	80	30
2	3	40	24 <sup>Note 1</sup>
3	3	80	12 <sup>Note 1</sup>
4	6	20	120 Note 1
6	4	20	72 Note 1,3,6
7	4	40	36 Note 1,4,6
8	4	80	18 <sup>Note 1,5,6</sup>
10	3	20	48 Note 1
NOTE 1: When determing UE requirements using Tinter1 for gap pattern IDs 2, 3, 4, 6, 7, 8, 10, Tinter1 = 60 for gap pattern IDs 2, 4, 6, 7, 10, and Tinter1 = 30 for gap pattern IDs 3 and 8 shall be used.  NOTE 2: Measurement gaps pattern configurations applicability is as specified in Table 9.1.2-1.			

NOTE 3: When this gap pattern is used, the T<sub>inter</sub> for E-UTRA inter-frequency measurements is 48 ms corresponding to the first 3 ms of the 4 ms gap.

NOTE 4: When this gap pattern is used, the T<sub>inter</sub> for E-UTRA inter-frequency

measurements is 24 ms corresponding to the first 3 ms of the 4 ms gap. NOTE 5: When this gap pattern is used, the T<sub>inter</sub> for E-UTRA inter-frequency

measurements is 12 ms corresponding to the first 3 ms of the 4 ms gap.

NOTE 6: This gap pattern is applicable for E-UTRA inter-frequency measurements only if gap based NR measurements are also configured.

A UE configured with gap pattern ID 2, 3 or 10 shall be able to detect a target cell, provided that

- the E-UTRA subframe #0 or #5 of the target E-UTRAN cell begins not earlier than  $500~\mu s$  from the start of the measurement gap, and
- the E-UTRA subframe #0 or #5 of the target E-UTRAN cell ends not later than 500 μs before the end of the measurement gap in case of FDD and not later than 750 μs before the end of measurement gap in case of TDD.

A UE configured with gap pattern ID 6, 7 or 8 shall be able to detect a target cell, provided that

- the E-UTRA subframe #0 or #5 of the target E-UTRAN cell begins not earlier than 500  $\mu s$  from the start of the measurement gap, and
- the E-UTRA subframe #0 or #5 of the target E-UTRAN cell ends no later than 1500 μs before the end of the measurement gap in case of FDD and no later than 1750 μs before the end of measurement gap in case of TDD.

## 9.4.2 NR - E-UTRAN FDD measurements

#### 9.4.2.1 Introduction

The requirements are applicable for NR-E-UTRAN FDD RSRP, RSRQ, and RS-SINR measurements.

In the requirements, an E-UTRAN FDD cell is considered to be detectable when:

- RSRP related conditions in the accuracy requirements in clause 10.2.2 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.3 of TS 36.133 [15],
- RSRQ related conditions in the accuracy requirements in clause 10.2.3 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.3 of TS 36.133 [15],
- RS-SINR related conditions in the accuracy requirements in clause 10.2.5 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.19 of TS 36.133 [15].

## 9.4.2.2 Requirements when no DRX is used

When the UE requires measurement gaps to identify and measure inter-RAT cells and an appropriate measurement gap pattern is scheduled, the UE shall be able to identify a new detectable FDD cell within T<sub>Identify, E-UTRAN FDD</sub> according to the following expression:

$$T_{\mathrm{Identify,E-UTRAN\,FDD}} = T_{\mathrm{BasicIdentify}} \cdot \frac{480}{T_{\mathrm{Inter1}}} \cdot \mathrm{CSSF}_{\mathrm{interRAT}} \quad ms,$$

where:

 $T_{BasicIdentify} = 480 \text{ ms},$ 

T<sub>Inter1</sub> is defined in clause 9.4.1,

 $CSSF_{interRAT} = CSSF_{within\_gap,i}$  is the scaling factor for the measured inter-RAT E-UTRA carrier *i* which is calculated as specified in clause 9.1.5.2.

Identification of a cell shall include detection of the cell and additionally performing a single measurement with measurement period of  $T_{\text{Measure, E-UTRAN FDD}}$  defined in Table 9.4.2.2-1.

Table 9.4.2.2-1: Measurement period and measurement bandwidth

Configuration	Physical Layer Measurement period:  TMeasure, E-UTRAN FDD [ms]	Measurement bandwidth [RB]
0	480 x CSSF <sub>interRAT</sub>	6
1 (Note 1)	240 x CSSF <sub>interRAT</sub>	50
NOTE 1: This configuration is optional.		

The UE shall be capable of identifying and performing NR – E-UTRAN FDD RSRP, RSRQ, and RS-SINR measurements of at least 4 identified E-UTRAN FDD cells per E-UTRA FDD carrier frequency layer during each layer 1 measurement period, for up to 7 E-UTRA FDD carrier frequency layers.

If higher layer filtering is used, an additional cell identification delay can be expected.

The NR – E-UTRAN FDD RSRP measurement accuracy for all measured cells shall be as specified in clause 10.2.2.

The NR – E-UTRAN FDD RSRQ measurement accuracy for all measured cells shall be as specified in clause 10.2.3.

The NR – E-UTRAN FDD RS-SINR measurement accuracy for all measured cells shall be as specified in clause 10.2.5.

## 9.4.2.3 Requirements when DRX is used

When DRX is in use and measurement gaps are configured, the UE shall be able to identify a new detectable E-UTRAN FDD cell within T<sub>Identify, E-UTRAN FDD</sub> specified in Table 9.4.2.3-1.

Table 9.4.2.3-1: Requirement to identify a newly detectable E-UTRAN FDD cell

DRX cycle length (s)	T <sub>Identify, E-UTRAN FDD</sub> (s) (DRX cycles)	
	Gap period = 40 ms, 20 ms	Gap period = 80 ms
≤0.16	Non-DRX requirements in	Non-DRX requirements in
	clause 9.4.2.2 apply	clause 9.4.2.2 apply
0.256	5.12* CSSFinterRAT	7.68* CSSFinterRAT
	(20*CSSF <sub>interRAT</sub> )	(30*CSSF <sub>interRAT</sub> )
0.32	6.4* CSSF <sub>interRAT</sub>	7.68* CSSF <sub>interRAT</sub>
	(20*CSSF <sub>interRAT</sub> )	(24*CSSF <sub>interRAT</sub> )
0.32< DRX-cycle ≤	Note1 (20*CSSFinterRAT)	Note1 (20*CSSF <sub>interRAT</sub> )
10.24		·
NOTE 1: The time depends on the DRX cycle length.		

NOTE 2: CSSF<sub>interRAT</sub> is as defined in clause 9.4.2.2.

When DRX is in use, the UE shall be capable of performing NR – E-UTRAN FDD RSRP, RSRQ, and RS-SINR measurements of at least 4 identified E-UTRAN FDD cells per E-UTRA FDD frequency layer during each layer 1 measurement period, for up to 7 E-UTRA FDD carrier frequency layers, and the UE physical layer shall be capable of

reporting NR - E-UTRAN FDD RSRP, RSRQ, and RS-SINR measurements to higher layers with the measurement period  $T_{\text{measure}, E-UTRAN FDD}$  specified in Table 9.4.2.3-2.

Table 9.4.2.3-2: Requirement to measure E-UTRAN FDD cells

DRX cycle length (s)	Tmeasure, E-UTRAN FDD (S) (DRX cycles)	
≤0.08 Non-DRX requirements in clause 9.4.2.2 apply		
0.08< DRX-cycle ≤10.24	Note1 (5* CSSF <sub>interRAT</sub> )	
NOTE 1: The time depends on the DRX cycle length.		
NOTE 2: CSSF <sub>interRAT</sub> is as defined in clause 9.4.2.2.		

If higher layer filtering is used, an additional cell identification delay can be expected.

The NR – E-UTRAN FDD RSRP measurement accuracy for all measured cells shall be as specified in clause 10.2.2.

The NR – E-UTRAN FDD RSRQ measurement accuracy for all measured cells shall be as specified in clause 10.2.3.

The NR – E-UTRAN FDD RS-SINR measurement accuracy for all measured cells shall be as specified in clause 10.2.5.

## 9.4.2.4 Measurement reporting requirements

## 9.4.2.4.1 Periodic Reporting

The reported NR – E-UTRAN FDD RSRP, RSRQ, and RS-SINR measurements contained in periodically triggered measurement reports shall meet the requirements in clauses 10.2.2, 10.2.3, and 10.2.5, respectively.

## 9.4.2.4.2 Event-Triggered Periodic Reporting

The reported NR – E-UTRAN FDD RSRP, RSRQ, and RS-SINR measurements contained in event-triggered periodic measurement reports shall meet the requirements in clauses 10.2.2, 10.2.3, and 10.2.5, respectively.

The first report in event-triggered periodic measurement reporting shall meet the requirements specified in clause 9.4.2.4.3.

## 9.4.2.4.3 Event-Triggered Reporting

The reported NR – E-UTRAN FDD RSRP, RSRQ, and RS-SINR measurements contained in event-triggered measurement reports shall meet the requirements in clauses 10.2.2, 10.2.3, and 10.2.5, respectively.

The UE shall not send any event-triggered measurement reports as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x TTI<sub>DCCH</sub> where TTI<sub>DCCH</sub> is the duration of subframe or slot or subslot when the measurement report is transmitted on the PUSCH with subframe or slot or subslot duration. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than T  $_{Identify, E-UTRAN \, FDD}$  defined in clauses 9.4.2.2 and 9.4.2.3 without DRX and with DRX, respectively. When L3 filtering is used, an additional delay can be expected.

If a cell which has been detectable at least for the time period  $T_{Identify, E-UTRAN FDD}$  becomes undetectable for a period  $\leq 5$  seconds and then the cell becomes detectable again and triggers an event as per TS 38.331 [2], the event triggered measurement reporting delay shall be less than  $T_{Measure, E-UTRAN FDD}$  provided the timing to that cell has not changed more than  $\pm$  50 Ts while measurement gap has not been available and the L3 filter has not been used.

## 9.4.3 NR - E-UTRAN TDD measurements

#### 9.4.3.1 Introduction

The requirements are applicable for NR-E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements.

In the requirements, an E-UTRAN TDD cell is considered to be detectable when:

- RSRP related conditions in the accuracy requirements in clause 10.2.2 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.3 of TS 36.133 [15],
- RSRQ related conditions in the accuracy requirements in clause 10.2.3 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.3 of TS 36.133 [15],

RS-SINR related conditions in the accuracy requirements in clause 10.2.5 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.19 of TS 36.133 [15].

## 9.4.3.2 Requirements when no DRX is used

When the UE requires measurement gaps to identify and measure inter-RAT cells and an appropriate measurement gap pattern is scheduled, the UE shall be able to identify a new detectable TDD cell within  $T_{Identify, E-UTRAN \ TDD}$  according to the following expression:

- When configuration 0 or configuration 1 in Table 9.4.3.2-1 is applied,

$$T_{\mathrm{Identify,E-UTRAN\ TDD}} = T_{\mathrm{BasicIdentify}} \cdot \frac{480}{T_{\mathrm{Inter1}}} \cdot \mathrm{CSSF}_{\mathrm{interRAT}} \quad ms,$$

- When configuration 2 or configuration 3 in Table 9.4.3.2-1 is applied,

$$T_{\rm Identify,E-UTRAN\,TDD} = T_{\rm Basic Identify} \cdot \frac{_{480}}{T_{\rm Inter1}} \cdot {\rm CSSF}_{\rm interRAT} + 240 \cdot {\rm CSSF}_{\rm interRAT} \hspace{0.5cm} ms,$$

where:

 $T_{\text{BasicIdentify}} = 480 \text{ ms},$ 

T<sub>Inter1</sub> is defined in clause 9.4.1,

 $CSSF_{interRAT} = CSSF_{within\_gap,i}$  is the scaling factor for the measured inter-RAT E-UTRA carrier *i* which is calculated as specified in clause 9.1.5.2.

Identification of a cell shall include detection of the cell and additionally performing a single measurement with measurement period of  $T_{\text{Measure, E-UTRAN TDD}}$  defined in Table 9.4.3.2-1.

Table 9.4.3.2-1: T<sub>Measure, E-UTRAN TDD</sub> for different configurations

Configuration	Measurement bandwidth	Number of UL/DL sub- frames per half frame (5 ms)		DwPTS		T <sub>Measure, E-UTRAN</sub> TDD (ms)
	(RB)	DL	UL	Normal CP	Extende d CP	
0	6	2	2	$19760 \cdot T_{\rm s}$	$20480 \cdot T_{\rm s}$	480 x CSSF <sub>interRAT</sub>
1 (Note 1)	50	2	2	$19760 \cdot T_{\rm s}$	$20480 \cdot T_{\rm s}$	240 x CSSF <sub>interRAT</sub>
2	6	1	3	$19760 \cdot T_{\rm s}$	$20480 \cdot T_{\rm s}$	720 x CSSF <sub>interRAT</sub>
3 (Note 1)	50	1	3	$19760 \cdot T_{\rm s}$	$20480 \cdot T_{\rm s}$	480 x CSSF <sub>interRAT</sub>

NOTE 1: This configuration is optional.

NOTE 2: Void

The UE shall be capable of identifying and performing NR – E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements of at least 4 identified E-UTRAN TDD cells per E-UTRA TDD carrier frequency layer during each layer 1 measurement period, for up to 7 E-UTRA TDD carrier frequency layers.

If higher layer filtering is used, an additional cell identification delay can be expected.

The NR – E-UTRAN TDD RSRP measurement accuracy for all measured cells shall be as specified in clause 10.2.2.

The NR – E-UTRAN TDD RSRQ measurement accuracy for all measured cells shall be as specified in clause 10.2.3.

The NR – E-UTRAN TDD RS-SINR measurement accuracy for all measured cells shall be as specified in clause 10.2.5.

### 9.4.3.3 Requirements when DRX is used

When DRX is in use and measurement gaps are configured, the UE shall be able to identify a new detectable E-UTRAN TDD cell within  $T_{Identify, E-UTRAN \, TDD}$  specified in Table 9.4.3.3-1.

Table 9.4.3.3-1: Requirement to identify a newly detectable E-UTRAN TDD cell

DRX cycle length (s)	T <sub>Identify</sub> , E-UTRAN TDD	(s) (DRX cycles)
	Gap period = 40 ms, 20	Gap period = 80 ms
	ms	
≤0.16	Non-DRX requirements in	Non-DRX requirements in
	clause 9.4.3.2 apply	clause 9.4.3.2 apply
0.256	5.12* CSSFinterRAT	7.68* CSSFinterRAT
	(20*CSSF <sub>interRAT</sub> )	(30*CSSF <sub>interRAT</sub> )
0.32	6.4* CSSFinterRAT	7.68* CSSFinterRAT
	(20*CSSF <sub>interRAT</sub> )	(24*CSSF <sub>interRAT</sub> )
0.32< DRX-cycle ≤10.24	Note1 (20*CSSF <sub>interRAT</sub> )	Note1 (20*CSSF <sub>interRAT</sub> )
	NOTE 1: The time depends on the DRX cycle length.	
NOTE 2: CSSF <sub>interRAT</sub> is as defined in clause 9.4.3.2.		

When DRX is in use, the UE shall be capable of performing NR – E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements of at least 4 identified E-UTRAN TDD cells per E-UTRA TDD frequency layer during each layer 1 measurement period, for up to 7 E-UTRA TDD carrier frequency layers, and the UE physical layer shall be capable of reporting NR – E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements to higher layers with the measurement period  $T_{\text{measure}, E-UTRAN TDD}$  specified in Table 9.4.3.3-2.

Table 9.4.3.3-2: Requirement to measure E-UTRAN TDD cells

DRX cycle length (s)	Tmeasure, E-UTRAN TDD (S) (DRX cycles)
≤0.08	Non-DRX Requirements in clause 9.4.3.2 apply
0.128	For configuration 2 Note3, non-DRX requirements
	in clause 9.4.3.2 apply,
	Otherwise: Note1 (5*CSSF <sub>interRAT</sub> )
0.128 <drx-cycle≤< td=""><td>Note1 (5*CSSF<sub>interRAT</sub>)</td></drx-cycle≤<>	Note1 (5*CSSF <sub>interRAT</sub> )
10.24	
NOTE 1: The time depends on the DRX cycle length.	
NOTE 2: CSSF <sub>interRAT</sub> is as defined in clause 9.4.3.2.	
NOTE 3: See Table 9.4.3.2-1.	

If higher layer filtering is used, an additional cell identification delay can be expected.

The NR – E-UTRAN TDD RSRP measurement accuracy for all measured cells shall be as specified in clause 10.2.2.

The NR – E-UTRAN TDD RSRQ measurement accuracy for all measured cells shall be as specified in clause 10.2.3.

The NR – E-UTRAN TDD RS-SINR measurement accuracy for all measured cells shall be as specified in clause 10.2.5.

#### 9.4.3.4 Measurement reporting requirements

#### 9.4.3.4.1 Periodic Reporting

The reported NR – E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements contained in periodically triggered measurement reports shall meet the requirements in clauses 10.2.2, 10.2.3, and 10.2.5, respectively.

#### 9.4.3.4.2 Event-Triggered Periodic Reporting

The reported NR – E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements contained in event-triggered periodic measurement reports shall meet the requirements in clauses 10.2.2, 10.2.3, and 10.2.5, respectively.

The first report in event-triggered periodic measurement reporting shall meet the requirements specified in clause 9.4.3.4.3.

## 9.4.3.4.3 Event-Triggered Reporting

The reported NR – E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements contained in event-triggered measurement reports shall meet the requirements in clauses 10.2.2, 10.2.3, and 10.2.5, respectively.

The UE shall not send any event-triggered measurement reports as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x TTI<sub>DCCH</sub> where TTI<sub>DCCH</sub> is the duration of subframe or slot or subslot when the measurement report is transmitted on the PUSCH with subframe or slot or subslot duration. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than T <sub>Identify, E-UTRAN TDD</sub> defined in clauses 9.4.3.2 and 9.4.3.3 without DRX and with DRX, respectively. When L3 filtering is used, an additional delay can be expected.

If a cell which has been detectable at least for the time period  $T_{Identify, E-UTRAN \, TDD}$  becomes undetectable for a period  $\leq 5$  seconds and then the cell becomes detectable again and triggers an event as per TS 38.331 [2], the event triggered measurement reporting delay shall be less than  $T_{Measure, E-UTRAN \, TDD}$  provided the timing to that cell has not changed more than  $\pm$  50 Ts while measurement gap has not been available and the L3 filter has not been used.

#### 9.4.4 Inter-RAT RSTD measurements

#### 9.4.4.1 NR - E-UTRAN FDD RSTD measurements

#### 9.4.4.1.1 Introduction

The requirements are applicable for NR-E-UTRAN FDD RSTD measurements requested via LPP [22, 27].

The requirements in clause 9.4.4.1 apply when:

- the UE is provided with the LTE timing information via LPP [27], including both *nr-LTE-SFN-Offset* and *nr-LTE-fineTiming-Offset*, or
- the UE is not provided with nr-LTE-SFN-Offset or nr-LTE-fineTiming-Offset, or
- the UE is provided with *nr-LTE-SFN-Offset* but not with *nr-LTE-fineTiming-Offset*.

When the UE is not aware of the SFN of at least one LTE cell in the OTDOA assistance data, the UE may be using When the UE is not aware of the SFN of at least one LTE cell in the OTDOA assistance data, the UE may be using autonomous gaps to acquire SFN of the OTDOA assistance data reference cell prior to requesting measurement gaps for performing the requested E-UTRA RSTD measurements before the  $T_{RSTD\ InterRAT,E-UTRANFDD}$  time period starts while meeting all the requirements in clause 9.4.4.1.2, provided that the OTDOA assistance data is provided to allow sufficient time for the UE to acquire the SFN before the  $T_{RSTD\ InterRAT,E-UTRANFDD}$  starts.

When the UE is not aware of and cannot derive the subframe timing difference between the NR serving cell and the OTDOA assistance data reference cell, the UE may need to request measurement gaps to perform cell detection for the OTDOA assistance data reference cell prior to requesting measurement gaps for performing the requested E-UTRA RSTD measurements before the  $T_{\rm RSTD\ InterRAT,E-UTRANFDD}$  time period starts while meeting all the requirements in

clause 9.4.4.1.2, provided that the OTDOA assistance data is provided to allow sufficient time for the UE to detect the cell before the  $T_{\text{RSTD InterRAT,E-UTRANFDD}}$  starts.

#### 9.4.4.1.2 Requirements

When the physical layer cell identities of neighbour cells together with the OTDOA assistance data are provided, the UE shall be able to detect and measure inter-RAT E-UTRAN FDD RSTD, specified in TS 38.215 [4], for at least n=16 cells, including the reference cell, within  $T_{RSTD \, InterRAT, E-UTRAN \, FDD}$  ms as given below:

$$T_{\text{RSTD InterRAT,E-UTRANFDD}} = T_{\text{PRS}} \cdot (M - 1) + \Delta$$
 ms,

where

 $T_{RSTD\ InterRAT,E-UTRANFDD}$  is the total time for detecting and measuring at least n cells,

 $T_{\rm PRS}$  is the largest value of the cell-specific positioning subframe configuration period, defined in TS 36.211 [23], among the measured n cells including the reference cell,

M is the number of PRS positioning occasions as defined in Table 9.4.4.1.2-1, where each PRS positioning occasion comprises of  $N_{PRS}$  (1 $\leq$   $N_{PRS}$  $\leq$ 6) consecutive downlink positioning subframes defined in TS 36.211 [23],

 $CSSF_{interRAT} = CSSF_{within\_gap,i}$  is the scaling factor determined by the gap sharing scheme for the RSTD measurements on the carrier frequency i as defined in clause 9.1.5.2,

 $\Delta = 160 \cdot \left[ \frac{n}{M} \right]$  ms is the measurement time for a single PRS positioning occasion which includes the sampling time

and the processing time, and

the n cells are distributed on up to two E-UTRAN FDD carrier frequencies.

Table 9.4.4.1.2-1: Number of PRS positioning occasions within  $T_{RSTD\ InterRAT,E-UTRANFDD}$ 

Positioning subframe	Number of PRS posi	tioning occasions $M$
configuration period $T_{ m PRS}$	f2 Note1	f1 and f2 Note2
160 ms	16 × CSSF <sub>interRAT</sub>	32 × CSSF <sub>interRAT</sub>
>160 ms	8 × CSSF <sub>interRAT</sub>	16 × CSSF <sub>interRAT</sub>
NOTE 1: When inter-RAT E-UTRAN FDD RSTD measurements are performed over the reference cell and neighbour cells, which belong to the E-UTRAN FDD carrier frequency f2.		

NOTE 2: When inter-RAT E-UTRAN FDD RSTD measurements are performed over the reference cell and the neighbour cells, which belong to the E-UTRAN FDD carrier frequency f1 and the E-UTRAN FDD carrier frequency f2 respectively.

The UE physical layer shall be capable of reporting RSTD for the reference cell and all the neighbor cells i out of at least (n-1) neighbor cells within  $T_{\text{RSTD InterRAT.E-UTRANFDD}}$  provided:

 $(PRS \hat{E}_s / Iot)_{ret} \ge -6 \text{ dB for all Frequency Bands for the reference cell,}$ 

 $(PRS \, \hat{E}_s / Iot)_i \ge -13 \, dB$  for all Frequency Bands for neighbour cell i,

 $\left( \text{PRS } \hat{\mathbf{E}}_{s} / \text{Iot} \right)_{ref}$  and  $\left( \text{PRS } \hat{\mathbf{E}}_{s} / \text{Iot} \right)_{i}$  conditions apply for all subframes of at least  $L = \frac{M}{2}$  PRS positioning

occasions,

PRP 1,2|dBm according to TS 36.133 [15, Annex B.2.6] for a corresponding Band,

 $PRS \,\hat{E}_s$  / Iot is defined as the ratio of the average received energy per PRS resource element during the useful part of the symbol to the average received power spectral density of the total noise and interference for this resource element, where the ratio is measured over all resource elements which carry PRS.

The time  $T_{RSTD\ InterRAT,E-UTRANFDD}$  starts from the first subframe of the PRS positioning occasion closest in time after both the OTDOA-RequestLocationInformation message and the OTDOA assistance data in the OTDOA-ProvideAssistanceData message via LPP as specified in TS 38.305 [22], are delivered to the physical layer of the UE.

The RSTD measurement accuracy for all measured neighbor cells *i* shall be fulfilled according to the accuracy as specified in clause 10.2.4.

#### 9.4.4.1.2.1 RSTD Measurement Reporting Delay

This requirement assumes that the measurement report is not delayed by other LPP signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is:  $2 \times TTI_{DCCH}$  where  $TTI_{DCCH}$  is the duration of subframe or slot or subslot when the measurement report is transmitted on the PUSCH with subframe or slot or subslot duration. This measurement reporting delay excludes any delay caused by no UL resources for UE to send the measurement report.

#### 9.4.4.1.2.2 Requirements for acquiring the timing of the E-UTRA OTDOA reference cell

When the UE is not aware of the SFN of at least one LTE cell in the OTDOA assistance data, the UE supporting per-FR gaps may make autonomous gaps in downlink reception and uplink transmission of the PCell, PSCell, and each of the SCells in FR1 for acquiring SFN of the reference cell in the E-UTRA OTDOA assistance data, while no autonomous gaps in downlink reception or uplink transmission are allowed in any of the UE serving cells in FR2. The UE, which are only supporting per-UE gaps, may make autonomous gaps in downlink reception and uplink transmission of the PCell, PSCell, and each of the SCells for acquiring the SFN of the reference cell in the E-UTRA OTDOA assistance data.

When the UE is not aware of and cannot derive the subframe timing difference between the NR serving cell and the OTDOA assistance data reference cell, the UE may need to request measurement gaps while indicating *eutra-FineTimingDetection* according to TS 38.331 [2] for detecting the reference cell in the E-UTRA OTDOA assistance data.

When the UE is performing one or both of SFN acquisition or cell detection as specified above, the UE shall be able to determine the timing of the E-UTRA OTDOA assistance data reference cell during the time period

$$T_{\text{RefCell,E-UTRAN}} = T_{\text{Detect, E-UTRAN FDD}} + T_{\text{MIB}} + T_{\text{ECGI}} \text{ ,}$$

#### where

T<sub>Detect, E-UTRAN FDD</sub> = T<sub>Identify, E-UTRAN FDD</sub> - T<sub>measure, E-UTRAN FDD</sub> is according to clause 9.4.2 assuming CSSF<sub>interRAT</sub>=1 and it is the time needed to detect the E-UTRA OTDOA assistance data reference cell when the UE needs to acquire the subframe and slot timing of the cell, provided the UE is configured with measurement gaps (T<sub>Detect, E-UTRAN FDD</sub>=0 when both *nr-LTE-SFN-Offset* and *nr-LTE-fineTiming-Offset* are provided in the E-UTRA OTDOA assistance data or the E-UTRA OTDOA assistance data reference cell is known to the UE), and

 $T_{MIB} = 50$  ms is the time required to acquire SFN of the E-UTRA OTDOA assistance data reference cell provided the OTDOA assistance data reference cell is decodable and at least all E-UTRA subframes #0 during  $T_{MIB}$  are available at the UE receiver ( $T_{MIB}=0$  when nr-LTE-SFN-Offset is provided in the E-UTRA OTDOA assistance data), and

 $T_{ECGI} = 100$  ms is the time required to acquire ECGI of the E-UTRA OTDOA assistance data reference cell when cellGlobalId is included in OTDOA-ReferenceCellInfo and the UE is not aware of the ECGI of this cell ( $T_{ECGI} = 0$  when cellGlobalId is not included in OTDOA-ReferenceCellInfo or the UE is aware of the ECGI of the E-UTRA OTDOA assistance data reference cell).

When detecting the E-UTRAN OTDOA reference cell, the requirements in this clause shall be met, provided the conditions for the detectable cell are fulfilled according to clause 9.4.2.1. In addition, the MIB of the E-UTRA OTDOA reference cell whose SFN is acquired shall be considered decodable by the UE provided the PBCH demodulation requirements are met according to TS 36.101 [25].

The requirement for acquiring the timing of the E-UTRA OTDOA reference cell within  $T_{RefCell,E-UTRAN}$  is applicable when no DRX is used as well as when any of the DRX cycles specified in TS 38.331 [2] is used.

When  $T_{MIB}>0$  and UE is using autonomous gaps during  $T_{MIB}$ , the UE shall transmit at least  $N_{ACK/NACK, MIB, FDD}$  ACK/NACKs on PCell, PSCell, and each of activated SCell(s) in the frequency range where the autonomous gaps are created, specified in Table 9.4.4.1.2.2-1. When  $T_{ECGI}>0$  and UE is using autonomous gaps during  $T_{ECGI}$ , the UE shall transmit at least  $N_{ACK/NACK, ECGI, FDD}$  ACK/NACKs on PCell, PSCell, and each of activated SCell(s) in the frequency range where the autonomous gaps are created, specified in Table 9.4.4.1.2.2-2. When both  $T_{MIB}>0$  and  $T_{ECGI}>0$  and UE

is using autonomous gaps during  $T_{MIB}+T_{ECGI}$ , the UE shall transmit on PCell, PSCell, and each of activated SCell(s) in the frequency range where autonomous gaps are created at least  $N_{ACK/NACK, MIB+ECGI, FDD}$  ACK/NACKs specified in Table 9.4.4.1.2.2-3, provided the OTDOA reference cell bandwidth is configured in the OTDOA assistance data [22, 27]. The requirements in Tables 9.4.4.1.2.2-1, 9.4.4.1.2.2-2, and 9.4.4.1.2.2-3 apply, provided that:

- there is continuous DL data allocation,
- no DRX cycle is used,
- no measurement gaps are configured,
- only one code word is transmitted in each slot,
- 2 slot ACK/NACK feedback is configured,
- 20 ms SMTC period is configured,
- SSBs are transmitted in one slot within SMTC window.

Table 9.4.4.1.2.2-1: Number of ACK/NACKs transmitted by the UE during T<sub>MIB</sub>

FDD FDD	SCS 15 kHz 30 kHz
FDD	30 kHz
· <del>-</del> -	
FDD	60 kHz
TDD Note 1	15 kHz
TDD Note 1	30 kHz
TDD Note 1	60 kHz
TDD Note 2	60 kHz
	120 kHz
	TDD Note 2 TDD Note 2

NOTE 1: TDD UL-DL configuration is as specified in Table A.3.3.1-1 of TS 38.101-1 [18]. NOTE 2: TDD UL-DL configuration is as specified in Table A.3.3.1-1 of TS 38.101-2 [19].

Table 9.4.4.1.2.2-2: Number of ACK/NACKs transmitted by the UE during Tecgi

Nack/nack, ecgi, fdd	Configuration of the serving cell in which the transmitted ACK/NACKs are counted	
	Duplex mode configuration	SCS
66	FDD	15 kHz
145	FDD	30 kHz
298	FDD	60 kHz
28	TDD Note 1	15 kHz
67	TDD Note 1	30 kHz
144	TDD Note 1	60 kHz
175	TDD Note 2	60 kHz
363	TDD Note 2	120 kHz

NOTE 1: TDD UL-DL configuration is as specified in Table A.3.3.1-1 of TS 38.101-1 [18]. NOTE 2: TDD UL-DL configuration is as specified in Table A.3.3.1-1 of TS 38.101-2 [19].

Configuration of the serving cell in which the transmitted ACK/NACKs NACK/NACK, MIB+ECGI, FDD are counted **Duplex mode configuration** SCS 84 FDD 15 kHz 193 FDD 30 kHz 402 FDD 60 kHz 28 TDD Note 1 15 kHz TDD Note 1 81 30 kHz TDD Note 1 159 60 kHz TDD Note 2 233 60 kHz TDD Note 2 491 120 kHz TDD UL-DL configuration is as specified in Table A.3.3.1-1 of TS 38.101-1 [18].

Table 9.4.4.1.2.2-3: Number of ACK/NACKs transmitted by the UE during T<sub>MIB</sub>+T<sub>ECGI</sub>

# NOTE 1. TDD 0L-DL configuration is as specified in Table A.3.3.1-1 of TS 38.101-1 [16]. NOTE 2: TDD UL-DL configuration is as specified in Table A.3.3.1-1 of TS 38.101-2 [19].

#### 9.4.4.2 NR - E-UTRAN TDD RSTD measurements

#### 9.4.4.2.1 Introduction

The requirements are applicable for NR-E-UTRAN TDD RSTD measurements requested via LPP [22, 27].

The requirements in clause 9.4.4.1 apply when:

- the UE is provided with the LTE timing information via LPP [27], including both *nr-LTE-SFN-Offset* and *nr-LTE-fineTiming-Offset*, or
- the UE is not provided with nr-LTE-SFN-Offset or nr-LTE-fineTiming-Offset, or
- the UE is provided with nr-LTE-SFN-Offset but not with nr-LTE-fineTiming-Offset.

When the UE is not aware of the SFN of at least one LTE cell in the OTDOA assistance data, the UE may be using autonomous gaps to acquire SFN of the OTDOA assistance data reference cell prior to requesting measurement gaps for performing the requested E-UTRA RSTD measurements before the  $T_{\rm RSTD\ InterRAT,E-UTRANTDD}$  time period starts while meeting all the requirements in clause 9.4.4.2.2, provided that the OTDOA assistance data is provided to allow sufficient time for the UE to acquire the SFN before the  $T_{\rm RSTD\ InterRAT,E-UTRANTDD}$  starts. When the UE is not aware of and cannot derive the subframe timing difference between the NR serving cell and the OTDOA assistance data reference cell, the UE may need to request measurement gaps to perform cell detection for the OTDOA assistance data reference cell prior to requesting measurement gaps for performing the requested E-UTRA RSTD measurements before the  $T_{\rm RSTD\ InterRAT,E-UTRANTDD}$  time period starts while meeting all the requirements in clause 9.4.4.2.2, provided that the OTDOA assistance data is provided to allow sufficient time for the UE to detect the cell before the  $T_{\rm RSTD\ InterRAT,E-UTRANTDD}$  starts.

## 9.4.4.2.2 Requirements

When the physical layer cell identities of neighbour cells together with the OTDOA assistance data are provided, the UE shall be able to detect and measure inter-RAT -UTRAN TDD RSTD, specified in TS 38.215 [4], for at least n=16 cells, including the reference cell, within  $T_{RSTD InterRAT.E-UTRAN TDD}$  ms as given below:

$$T_{\text{RSTD InterRAT,E-UTRANTDD}} = T_{\text{PRS}} \cdot (M - 1) + \Delta$$
 ms

where

 $T_{RSTD\ InterRAT,E-UTRANTDD}$  is the total time for detecting and measuring at least n cells,

 $T_{\rm PRS}$  is the largest value of the cell-specific positioning subframe configuration period, defined in TS 36.211 [23], among the measured n cells including the reference cell,

M is the number of PRS positioning occasions as defined in Table 9.4.4.2.2-1, where a PRS positioning occasion is as defined in clause 9.4.4.1.2,

 $CSSF_{interRAT} = CSSF_{within\_gap,i}$  is the scaling factor determined by the gap sharing scheme for the RSTD measurements on the carrier frequency *i* as defined in clause 9.1.5.2,

 $\Delta = 160 \cdot \left[ \frac{n}{M} \right]$  ms is the measurement time for a single PRS positioning occasion which includes the sampling time

and the processing time, and

the n cells are distributed on up to two E-UTRAN TDD carrier frequencies.

Table 9.4.4.2.2-1: Number of PRS positioning occasions within  $T_{\text{RSTD InterRAT,E-UTRANTDD}}$ 

Positioning subframe Number of PRS positioning occasions ${\cal M}$		tioning occasions $M$
configuration period $T_{ m PRS}$	f2 Note1	f1 and f2 Note2
160 ms	16 × CSSF <sub>interRAT</sub>	32 × CSSF <sub>interRAT</sub>
>160 ms 8 × CSSF <sub>interRAT</sub> 16 × CSSF <sub>interl</sub>		16 × CSSF <sub>interRAT</sub>
NOTE 1: When inter-RAT E-UTRAN TDD RSTD measurements are performed over the reference cell and neighbour cells, which belong to the E-UTRAN TDD carrier frequency f2.		
NOTE 2: When inter-RAT E-UTRAN TDD RSTD measurements are performed over the reference cell and the neighbour cells, which belong to the E-UTRAN TDD carrier frequency f1 and the E-UTRAN TDD carrier frequency f2 respectively.		

The requirements in this clause shall apply for all TDD special subframe configurations specified in TS 36.211 [23] and for the TDD uplink-downlink configurations as specified in Table 9.4.4.2.2-2 for UE requiring measurement gaps for these measurements. For UEs capable of performing inter-RAT RSTD measurements without measurement gaps, TDD uplink-downlink subframe configurations as specified in Table 9.4.4.2.2-3 shall apply.

Table 9.4.4.2.2-2: TDD uplink-downlink subframe configurations applicable for inter-RAT RSTD requirements

PRS Transmission Bandwidth (RB)	Applicable TDD uplink-downlink configurations	
6, 15	3, 4 and 5	
25	1, 2, 3, 4, 5 and 6	
50, 75, 100	0, 1, 2, 3, 4, 5 and 6	
NOTE 1: Uplink-downlink configurations are specified in Table 4.2-2 in TS 36.211 [23].		

Table 9.4.4.2.2-3: TDD uplink-downlink subframe configurations applicable for inter-RAT RSTD requirements without gaps

PRS Transmission Bandwidth (RB)	Applicable TDD uplink-downlink configurations
6, 15	1, 2, 3, 4 and 5
25, 50, 75, 100	0, 1, 2, 3, 4, 5 and 6
NOTE 1: Uplink-downlink configurations are specified in Table 4.2-2 in TS 36.211 [23].	

The UE physical layer shall be capable of reporting RSTD for the reference cell and all the neighbor cells i out of at least (n-1) neighbor cells within  $T_{\text{RSTD InterRAT,E-UTRANTDD}}$  provided:

$$(PRS \, \hat{E}_s \, / \, Iot)_{ref} \ge -6 \, dB$$
 for all Frequency Bands for the reference cell,  $(PRS \, \hat{E}_s \, / \, Iot)_i \ge -13 \, dB$  for all Frequency Bands for neighbour cell  $i$ ,  $(PRS \, \hat{E}_s \, / \, Iot)_{ref}$  and  $(PRS \, \hat{E}_s \, / \, Iot)_i$  conditions apply for all subframes of at least  $L = \frac{M}{2}$  PRS positioning occasions, PRP 1,2| $_{dBm}$  according to TS 36.133 [15, Annex B.2.6] for a corresponding Band,

PRS  $\hat{E}_s$  / Iot is as defined in clause 9.4.4.1.2.

The time  $T_{RSTD\ InterRAT,E-UTRANTDD}$  starts from the first subframe of the PRS positioning occasion closest in time after both the OTDOA-RequestLocationInformation message and the OTDOA assistance data in the OTDOA-ProvideAssistanceData message via LPP as specified in TS 38.305 [22], are delivered to the physical layer of the UE.

The RSTD measurement accuracy for all measured neighbor cells *i* shall be fulfilled according to the accuracy as specified in clause 10.2.4.

#### 9.4.4.2.2.1 RSTD Measurement Reporting Delay

This requirement assumes that that the measurement report is not delayed by other LPP signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is:  $2 \times TTI_{DCCH}$  where  $TTI_{DCCH}$  is the duration of subframe or slot or subslot when the measurement report is transmitted on the PUSCH with subframe or slot or subslot duration. This measurement reporting delay excludes any delay caused by no UL resources for UE to send the measurement report.

#### 9.4.4.2.2.2 Requirements for acquiring the timing of the E-UTRA OTDOA reference cell

When the UE is not aware of the SFN of at least one LTE cell in the OTDOA assistance data, the UE supporting per-FR gaps may make autonomous gaps in downlink reception and uplink transmission of the PCell, PSCell, and each of the SCells in FR1 for acquiring SFN of the reference cell in the E-UTRA OTDOA assistance data, while no autonomous gaps in downlink reception or uplink transmission are allowed in any of the UE serving cells in FR2. The UE, which are only supporting per-UE gaps, may make autonomous gaps in downlink reception and uplink transmission of the PCell, PSCell, and each of the SCells for acquiring the SFN of the reference cell in the E-UTRA OTDOA assistance data.

When the UE is not aware of and cannot derive the subframe timing difference between the NR serving cell and the OTDOA assistance data reference cell, the UE may need to request measurement gaps while indicating *eutra-FineTimingDetection* according to TS 38.331 [2] for detecting the reference cell in the E-UTRA OTDOA assistance data.

When the UE is performing one or both of SFN acquisition or cell detection as specified above, the UE shall be able to determine the timing of the E-UTRA OTDOA assistance data reference cell during the time period

 $T_{\text{RefCell,E-UTRAN}} = T_{\text{Detect, E-UTRAN TDD}} + T_{\text{MIB}} + T_{\text{ECGI}}$ ,

where

T<sub>Detect, E-UTRAN TDD</sub> = T<sub>Identify, E-UTRAN TDD</sub> - T<sub>measure, E-UTRAN TDD</sub> is according to clause 9.4.3 assuming CSSF<sub>interRAT</sub>=1 and it is the time needed to detect the E-UTRA OTDOA assistance data reference cell when the UE needs to acquire the subframe and slot timing of the cell, provided the UE is configured with measurement gaps (T<sub>Detect, E-UTRAN TDD</sub>=0 when both *nr-LTE-SFN-Offset* and *nr-LTE-fineTiming-Offset* are provided in the E-UTRA OTDOA assistance data or the E-UTRA OTDOA assistance data reference cell is known to the UE), and

 $T_{MIB} = 50$  ms is the time required to acquire SFN of the E-UTRA OTDOA assistance data reference cell provided the OTDOA assistance data reference cell is decodable and at least all E-UTRA subframes #0 during  $T_{MIB}$  are available at the UE receiver ( $T_{MIB} = 0$  when nr-LTE-SFN-Offset is provided in the E-UTRA OTDOA assistance data), and

 $T_{ECGI} = 100$  ms is the time required to acquire ECGI of the E-UTRA OTDOA assistance data reference cell when cellGlobalId is included in OTDOA-ReferenceCellInfo and the UE is not aware of the ECGI of this cell ( $T_{ECGI} = 0$  when cellGlobalId is not included in OTDOA-ReferenceCellInfo or the UE is aware of the ECGI of the E-UTRA OTDOA assistance data reference cell).

When detecting the E-UTRAN OTDOA reference cell, the requirements in this clause shall be met, provided the conditions for the detectable cell are fulfilled according to clause 9.4.3.1. In addition, the MIB of the E-UTRA OTDOA reference cell whose SFN is acquired shall be considered decodable by the UE provided the PBCH demodulation requirements are met according to TS 36.101 [25].

The requirement for acquiring the timing of the E-UTRA OTDOA reference cell within  $T_{RefCell,E-UTRAN}$  is applicable when no DRX is used as well as when any of the DRX cycles specified in TS 38.331 [2] is used.

When  $T_{MIB}>0$  and UE is using autonomous gaps during  $T_{MIB}$ , the UE shall transmit at least  $N_{ACK/NACK, MIB, TDD}$  ACK/NACKs on PCell, PSCell, and each of activated SCell(s) in the frequency range where the autonomous gaps are

created, specified in Table 9.4.4.2.2.2-1. When  $T_{ECGI} > 0$  and UE is using autonomous gaps during  $T_{ECGI}$ , the UE shall transmit at least  $N_{ACK/NACK, ECGI, TDD}$  ACK/NACKs on PCell, PSCell, and each of activated SCell(s) in the frequency range where autonomous gaps are created, specified in Table 9.4.4.2.2.2-2. When both  $T_{MIB} > 0$  and  $T_{ECGI} > 0$  and UE is using autonomous gaps during  $T_{MIB} + T_{ECGI}$ , the UE shall transmit on PCell, PSCell, and each of activated SCell(s) in the frequency range where autonomous gaps are created at least  $N_{ACK/NACK, MIB+ECGI, TDD}$  ACK/NACKs specified in Table 9.4.4.2.2.2-3, provided the OTDOA reference cell bandwidth is configured in the OTDOA assistance data [22, 27]. The requirements in Tables 9.4.4.2.2.2-1, 9.4.4.2.2.2-2 and 9.4.4.2.2.2-3 apply, provided that:

- there is continuous DL data allocation,
- no DRX cycle is used,
- no measurement gaps are configured,
- only one code word is transmitted in each slot,
- 2 slot ACK/NACK feedback is configured,
- 20 ms SMTC period is configured,
- SSBs are transmitted in one slot within SMTC window.

Table 9.4.4.2.2.2-1: Minimum number of ACK/NACKs transmitted by the UE during T<sub>MIB</sub>

Nack/nack, mib, tdd	Configuration of the serving cell in which the transmitted ACK/NACKs are counted	
	Duplex mode configuration	SCS
15	FDD	15 kHz
39	FDD	30 kHz
85	FDD	60 kHz
0	TDD Note 1	15 kHz
4	TDD Note 1	30 kHz
12	TDD Note 1	60 kHz
46	TDD Note 2	60 kHz
104	TDD Note 2	120 kHz
	uration is as specified in Table A.3.3.1-1 of TS	

Table 9.4.4.2.2.2-2: Number of ACK/NACKs transmitted by the UE during T<sub>ECGI</sub>

Nack/nack, ecgi, tdd	Configuration of the serving cell in which the transmitted ACK/NACKs are counted	
	Duplex mode configuration	SCS
66	FDD	15 kHz
145	FDD	30 kHz
298	FDD	60 kHz
28	TDD Note 1	15 kHz
67	TDD Note 1	30 kHz
144	TDD Note 1	60 kHz
175	TDD Note 2	60 kHz
363	TDD Note 2	120 kHz

NOTE 1: TDD UL-DL configuration is as specified in Table A.3.3.1-1 of TS 38.101-1 [18]. NOTE 2: TDD UL-DL configuration is as specified in Table A.3.3.1-1 of TS 38.101-2 [19].

Table 9.4.4.2.2.2-3: Number of ACK/NACKs transmitted by the UE during T<sub>MIB</sub>+T<sub>ECGI</sub>

Nack/nack, MIB+ECGI, TDD  Configuration of the serving cell in which the transmitted ACK are counted		
	Duplex mode configuration	scs
84	FDD	15 kHz
193	FDD	30 kHz
402	FDD	60 kHz
28	TDD Note 1	15 kHz
81	TDD Note 1	30 kHz
159	TDD Note 1	60 kHz
233	TDD Note 2	60 kHz
491	TDD Note 2	120 kHz
NOTE 1: TDD UL-DL configuration is as specified in Table A.3.3.1-1 of TS 38.101-1 [18].  NOTE 2: TDD UL-DL configuration is as specified in Table A.3.3.1-1 of TS 38.101-2 [19].		

#### 9.4.5 Inter-RAT E-CID measurements

#### 9.4.5.1 NR-E-UTRAN FDD E-CID RSRP and RSRQ measurements

#### 9.4.5.1.1 Introduction

The requirements in clause 9.4.5.1. shall apply provided the UE has received *ECID-RequestLocationInformation* message from LMF via LPP requesting the UE to report inter-RAT E-UTRAN FDD E-CID RSRP and RSRQ measurements [22, 27].

#### 9.4.5.1.2 Requirements

The requirements in clause 9.4.2 also apply for this clause except the measurement reporting requirements. The measurement reporting requirements for E-CID RSRP and RSRQ are defined in clause 9.4.5.1.3.

#### 9.4.5.1.3 Measurement Reporting Delay

This requirement assumes that that the measurement report is not delayed by other LPP signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is:  $2 \times TTI_{DCCH}$  where  $TTI_{DCCH}$  is the duration of subframe or slot or subslot when the measurement report is transmitted on the PUSCH with subframe or slot or subslot duration. This measurement reporting delay excludes any delay caused by no UL resources for UE to send the measurement report.

Reported RSRP and RSRQ measurements contained in periodically triggered measurement reports shall meet the requirements in clauses 10.2.2 and 10.2.3, respectively.

#### 9.4.5.2 NR-E-UTRAN TDD E-CID RSRP and RSRQ measurements

#### 9.4.5.2.1 Introduction

The requirements in clause 9.4.5.2. shall apply provided the UE has received *ECID-RequestLocationInformation* message from LMF via LPP requesting the UE to report inter-RAT E-UTRAN TDD E-CID RSRP and RSRQ measurements [22, 27].

#### 9.4.5.2.2 Requirements

The requirements in clause 9.4.3 also apply for this clause except the measurement reporting requirements. The measurement reporting requirements for E-CID RSRP and RSRQ are defined in clause 9.4.5.2.3.

#### 9.4.5.2.3 Measurement Reporting Delay

This requirement assumes that the measurement report is not delayed by other LPP signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is:  $2 \times TTI_{DCCH}$  where  $TTI_{DCCH}$  is the duration of subframe or slot or subslot when the measurement report is transmitted on the PUSCH with subframe or slot or subslot duration. This measurement reporting delay excludes any delay caused by no UL resources for UE to send the measurement report.

Reported RSRP and RSRQ measurements contained in periodically triggered measurement reports shall meet the requirements in clauses 10.2.2 and 10.2.3, respectively.

# 9.5 L1-RSRP measurements for Reporting

## 9.5.1 Introduction

When configured by the network, the UE shall be able to perform L1-RSRP measurements of configured CSI-RS, SSB or CSI-RS and SSB resources for L1-RSRP. The measurements shall be performed for a serving cell, including PCell, PSCell, or SCell, on the resources configured for L1-RSRP measurements within the active BWP.

The UE shall be able to measure all CSI-RS resources and/or SSB resources of the *nzp-CSI-RS-ResourceSet* and/or *csi-SSB-ResourceSet* within the CSI-Resource*Config* settings configured for L1-RSRP for the active BWP, provided that the number of resources does not exceed the UE capability indicated by *beamManagementSSB-CSI-RS*.

The UE shall report the measurement quantity (*reportQuantity*) and send periodic, semi-persistent or aperiodic reports, according to the *reportConfigType* according to the CSI reporting configuration(s) (*CSI-ReportConfig*) for the active BWP.

# 9.5.2 Requirements applicability

The requirements in clause 9.5 apply, provided:

- The CSI-RS or SSB or CSI-RS and SSB resources configured for L1-RSRP measurements are measurable.

An SSB resource configured for L1-RSRP shall be considered measurable when for each relevant SSB the following conditions are met:

- L1-RSRP related side conditions given in clauses 10.1.19.1 and 10.1.20.1 for FR1 and FR2, respectively, for a corresponding band,
- SSB\_RP and SSB Ês/Iot according to Annex B.2.4.1 for a corresponding band.

A CSI-RS resource configured for L1-RSRP shall be considered measurable when for each relevant CSI-RS the following conditions are met:

- L1-RSRP related side conditions given in clauses 10.1.19.2 and 10.1.20.2 for FR1 and FR2, repectively, for a corresponding band,
- CSI-RS\_RP and CSI-RS Ês/Iot according to Annex B.2.4.2 for a corresponding band.

A CSI-RS and SSB resource configured for L1-RSRP shall be considered measurable when the measurable resource conditions are met for both CSI-RS resource and SSB resource.

Requirements are defined for periodic, semi-persistent and aperiodic resources.

# 9.5.3 Measurement Reporting Requirements

The UE shall send L1-RSRP reports only for report configurations configured for the active BWP.

The UE shall report the L1-RSRP value as a 7-bit value in the range [-140, -44] dBm with 1dB step size according to clause 10.1.19 for FR1 and 10.1.20 for FR2 if *nrofReportedRS* is configured to one. If *nrofReportedRS* is configured to

be larger than one, or if *groupBasedBeamReporting* is enabled, the UE shall use differential L1-RSRP based reporting as defined in clause 10.1.19 for FR1 and 10.1.20 for FR2. The differential L1-RSRP is quantized to a 4-bit value with 2dB step size. The mapping between the reported L1-RSRP value and the measured quantity is described in 10.1.6.

#### 9.5.3.1 Periodic Reporting

Reported L1-RSRP measurements contained in periodic L1-RSRP measurement reports shall meet the requirements in clauses 10.1.19 for FR1 and 10.1.20 for FR2, respectively.

The UE shall only send periodic L1-RSRP measurement reports for an active BWP.

The UE shall transmit the periodic L1-RSRP reporting on PUCCH over the air interface according to the periodicity defined in clause 5.2.1.4 in TS 36.300 [24].

## 9.5.3.2 Semi-Persistent Reporting

Reported L1-RSRP measurements contained in a Semi-Persistent L1-RSRP measurement report shall meet the requirements in clauses 10.1.19 for FR1 and 10.1.20 for FR2, respectively. This requirement applies for semi-persistent L1-RSRP reports send on PUSCH or PUCCH.

The UE shall only send semi-persistent L1-RSRP measurement reports on PUSCH, if a DCI request has been received.

The UE shall only send semi-persistent L1-RSRP measurement reports on PUCCH, if an activation command [7] has been received.

The UE shall transmit the semi-persistent L1-RSRP reporting on PUSCH or PUCCH over the air interface according to the periodicity defined in clause 5.2.1.4 in TS 36.300 [24].

#### 9.5.3.3 Aperiodic Reporting

Reported L1-RSRP measurements contained in aperiodic triggered, aperiodic triggered periodic and aperiodic triggered semi-persistent L1-RSRP reports shall meet the requirements in clauses 10.1.19 for FR1 and 10.1.20 for FR2, respectively.

The UE shall only send aperiodic L1-RSRP measurement reports, if a DCI trigger has been received.

After the UE receives CSI request in DCI, the UE shall transmit the aperiodic L1-RSRP reporting on PUSCH over the air interface at the time specified according to clause 6.2.1.2 in TS 36.300 [24].

# 9.5.4 L1-RSRP measurement requirements

#### 9.5.4.1 SSB based L1-RSRP Reporting

The UE shall be capable of performing L1-RSRP measurements based on the configured SSB resource for L1-RSRP computation, and the UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of  $T_{L1-RSRP\ Measurement\ Period\ SSB}$ .

The value of  $T_{L1\text{-RSRP Measurement Period SSB}}$  is defined in Table 9.5.4.1-1 for FR1 and Table 9.5.4.1-2 for FR2, where

- M=1 if higher layer parameter timeRestrictionForChannelMeasurement is configured, and M=3 otherwise
- N=8.

For FR1,

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

For FR2,

- $P = \frac{1}{1 \frac{T_{SSB}}{T_{SMTCperiod}}}$ , when SSB is not overlapped with measurement gap and SSB is partially overlapped with
  - SMTC occasion ( $T_{SSB} \le T_{SMTCperiod}$ ).
- P is  $P_{\text{sharing factor}}$ , when SSB is not overlapped with measurement gap and SSB is fully overlapped with SMTC period ( $T_{\text{SSB}} = T_{\text{SMTCperiod}}$ ).
- $P = \frac{1}{1 \frac{T_{SSB}}{MRGP} \frac{T_{SSB}}{T_{SMTCperiod}}}, \text{ when SSB is partially overlapped with measurement gap and SSB is partially overlapped}$

with SMTC occasion (T<sub>SSB</sub> < T<sub>SMTCperiod</sub>) and SMTC occasion is not overlapped with measurement gap and

- $T_{SMTCperiod} \neq MGRP$  or
- $T_{SMTCperiod}$  = MGRP and  $T_{SSB}$   $\!<$   $\!0.5^*T_{SMTCperiod}$
- P is  $\frac{1}{1-\frac{T_{SSB}}{MRGP}}$ \* P<sub>sharing factor</sub>, when SSB is partially overlapped with measurement gap and SSB is partially overlapped with SMTC occasion ( $T_{SSB} < T_{SMTCperiod}$ ) and SMTC occasion is not overlapped with measurement gap and  $T_{SMTCperiod} = MGRP$  and  $T_{SSB} = 0.5*T_{SMTCperiod}$
- $P = \frac{1}{1 \frac{T_{SSB}}{\min{(T_{SMTCperiod}, MGRP)}}}$ , when SSB is partially overlapped with measurement gap ( $T_{SSB} < MGRP$ ) and SSB is partially overlapped with SMTC occasion ( $T_{SSB} < T_{SMTCperiod}$ ) and SMTC occasion is partially or fully overlapped with measurement gap.
- P is  $\frac{1}{1-\frac{T_{SSB}}{MRGP}}$ \*  $P_{sharing\ factor}$ , when SSB is partially overlapped with measurement gap and SSB is fully overlapped with SMTC occasion ( $T_{SSB} = T_{SMTCperiod}$ ) and SMTC occasion is partially overlapped with measurement gap ( $T_{SMTCperiod} < MGRP$ ) $P_{sharing\ factor} = 1$ 
  - if all of the reference signals configured for L1-RSRP reporting outside measurement gap are not fully overlapped by intra-frequency SMTC occasions, or
  - if all of the reference signal configured for L1-RSRP reporting outside measurement gap and fullyoverlapped by intra-frequency SMTC occasions are not overlapped by with the SSB symbols indicated by
    SSB-ToMeasure and 1 symbol before each consecutive SSB symbols indicated by SSB-ToMeasure and 1
    symbol after each consecutive SSB symbols indicated by SSB-ToMeasure, given that SSB-ToMeasure is
    configured;
- $P_{\text{sharing factor}} = 3$ , otherwise.

#### Where:

 $T_{SSB} = ssb$ -periodicityServingCell

T<sub>SMTCperiod</sub> = the configured SMTC1 period or SMTC2 period if configured

If the high layer in TS 38.331 [2] signaling of smtc2 is configured,  $T_{SMTCperiod}$  corresponds to the value of higher layer parameter smtc2; Otherwise  $T_{SMTCperiod}$  corresponds to the value of higher layer parameter smtc1.

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

Table 9.5.4.1-1: Measurement period TL1-RSRP\_Measurement\_Period\_SSB for FR1

Cor	Configuration T <sub>L1-RSRP_Measurement_Period_SSB</sub> (ms)	
non-DRX max(T <sub>Report</sub> , ceil(M*P)*T <sub>SSB</sub> )		max(T <sub>Report</sub> , ceil(M*P)*T <sub>SSB</sub> )
DRX c	ycle ≤ 320ms	max(T <sub>Report</sub> , ceil(1.5*M*P)*max(T <sub>DRX</sub> ,T <sub>SSB</sub> ))
DRX cycle > 320ms		ceil(M*P)*T <sub>DRX</sub>
Note:	T <sub>SSB</sub> = ssb-pe	riodicityServingCell is the periodicity of the SSB-Index
	configured for L1-RSRP measurement. T <sub>DRX</sub> is the DRX cycle length.	
T <sub>Report</sub> is configured periodicity for reporting.		

Table 9.5.4.1-2: Measurement period T<sub>L1-RSRP Measurement Period SSB</sub> for FR2

Configuration	T <sub>L1-RSRP_Measurement_Period_SSB</sub> (ms)
non-DRX	max(T <sub>Report</sub> , ceil(M*P*N)*T <sub>SSB</sub> )
DRX cycle ≤ 320ms	max(T <sub>Report</sub> , ceil(1.5*M*P*N)*max(T <sub>DRX</sub> ,T <sub>SSB</sub> ))
DRX cycle > 320ms	ceil(1.5*M*P*N)*T <sub>DRX</sub>
configured f	periodicityServingCell is the periodicity of the SSB-Index or L1-RSRP measurement. T <sub>DRX</sub> is the DRX cycle length. Ifigured periodicity for reporting.

# 9.5.4.2 CSI-RS based L1-RSRP Reporting

The UE shall be capable of performing L1-RSRP measurements based on the configured CSI-RS resource for L1-RSRP computation, and the UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of  $T_{L1-RSRP\ Measurement\ Period\ CSI-RS}$ .

The value of T<sub>L1-RSRP Measurement Period CSI-RS</sub> is defined in Table 9.5.4.2-1 for FR1 and in Table 9.5.4.2-2 for FR2, where

- For periodic and semi-persistent CSI-RS resources, M=1 if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and M=3 otherwise
- For aperiodic CSI-RS resources M=1
- For periodic CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply if *qcl-InfoPeriodicCSI-RS* is configured for all the resources in the resource set and for each resource one RS has QCL-TypeD with
  - SSB for L1-RSRP measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For periodic CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / N<sub>res\_per\_set</sub>), where N<sub>res\_per\_set</sub> is number of resources in the resource set. The requirements apply provided *qcl-InfoPeriodicCSI-RS* is configured for all resources in the resource set.
- For semi-persistent CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set and for each resource one RS has QCL-TypeD with
  - SSB for L1-RSRP measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For semi-persistent CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / N<sub>res\_per\_set</sub>), where N<sub>res\_per\_set</sub> is number of resources in the resource set. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set.
- For aperiodic CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requriements apply provided *qcl-info* is configured for all resources in the resource set and for each resource one RS has QCL-TypeD with
  - SSB for L1-RSRP measurement, or
  - another CSI-RS in resource set configured with repetition ON.
- For aperiodic CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to ON, N=1. UE is not required to meet the accuracy requirements in clause 10.1.19.2 and 10.1.20.2 if number of resources in the resource set is smaller than *maxNumberRxBeam*. The requirements apply provided *qcl-info* is configured for all resources in the resource set.

For FR1,

- $P = \frac{1}{1 \frac{T_{CSI-RS}}{MRGP}}$ , when in the monitored cell there are measurement gaps configured for intra-frequency, interfrequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS; and
- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

#### For FR2,

- P=1, when CSI-RS is not overlapped with measurement gap and also not overlapped with SMTC occasion.
- $P = \frac{1}{1 \frac{T_{CSI-RS}}{MRGP}}$ , when CSI-RS is partially overlapped with measurement gap and CSI-RS is not overlapped with SMTC occasion ( $T_{CSI-RS} < MGRP$ )
- $P = \frac{1}{1 \frac{T_{CSI-RS}}{T_{SMTCperiod}}}$ , when CSI-RS is not overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion ( $T_{CSI-RS} < T_{SMTCperiod}$ ).
- P=3, when CSI-RS is not overlapped with measurement gap and CSI-RS is fully overlapped with SMTC occasion (T<sub>CSI-RS</sub> = T<sub>SMTCperiod</sub>).
- $P = \frac{1}{1 \frac{T_{CSI-RS}}{MRGP} \frac{T_{CSI-RS}}{T_{SMTCperiod}}}$ , when CSI-RS is partially overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion (TCSI-RS <  $T_{SMTCperiod}$ ) and SMTC occasion is not overlapped with measurement gap and
  - $T_{SMTCperiod} \neq MGRP$  or
  - $T_{SMTCperiod} = MGRP$  and  $T_{CSI-RS} < 0.5*T_{SMTCperiod}$
- $P = \frac{3}{1 \frac{T_{CSI-RS}}{MRGP}}$ , when CSI-RS is partially overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion ( $T_{CSI-RS} < T_{SMTCperiod}$ ) and SMTC occasion is not overlapped with measurement gap and  $T_{SMTCperiod} = MGRP$  and  $T_{CSI-RS} = 0.5*T_{SMTCperiod}$
- $P = \frac{1}{1 \frac{T_{CSI-RS}}{\min(T_{SMTCperiod},MGRP)}}$ , when CSI-RS is partially overlapped with measurement gap ( $T_{CSI-RS} < MGRP$ ) and CSI-RS is partially overlapped with SMTC occasion ( $T_{CSI-RS} < T_{SMTCperiod}$ ) and SMTC occasion is partially or fully overlapped with measurement gap.
- $P = \frac{3}{1 \frac{T_{CSI-RS}}{MRGP}}$ , when CSI-RS is partially overlapped with measurement gap and CSI-RS is fully overlapped with SMTC occasion ( $T_{CSI-RS} = T_{SMTCperiod}$ ) and SMTC occasion is partially overlapped with measurement gap ( $T_{SMTCperiod} < MGRP$ )

#### Where:

T<sub>SMTCperiod</sub> = the configured SMTC1 period or SMTC2 period if configured.

 $T_{CSI-RS}$  = the periodicity of CSI-RS configured for L1-RSRP measurement

If the high layer in TS 38.331 [2] signaling of smtc2 is configured,  $T_{SMTCperiod}$  corresponds to the value of higher layer parameter smtc2; Otherwise  $T_{SMTCperiod}$  corresponds to the value of higher layer parameter smtc1.

Note: The overlap between CSI-RS for L1-RSRP measurement and SMTC means that CSI-RS for L1-RSRP measurement is within the SMTC window duration.

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

Table 9.5.4.2-1: Measurement period T<sub>L1-RSRP Measurement Period CSI-RS</sub> for FR1

Conf	iguration	T <sub>L1-RSRP_Measurement_Period_CSI-RS</sub> (ms)		
non-DRX		max(T <sub>Report</sub> , ceil(M*P)*T <sub>CSI-RS</sub> )		
DRX cycle ≤ 320ms		max(T <sub>Report</sub> , ceil(1.5*M*P)*max(T <sub>DRX</sub> ,T <sub>CSI-RS</sub> ))		
DRX cy	cle > 320ms	ceil(M*P)*T <sub>DRX</sub>		
Note 1:	1: T <sub>CSI-RS</sub> is the periodicity of CSI-RS configured for L1-RSRP			
Note 2:	periodicity for	t. T <sub>DRX</sub> is the DRX cycle length. T <sub>Report</sub> is configured reporting.  ents are applicable provided that the CSI-RS resource		
		r L1-RSRP measurement is transmitted with Density =		

Table 9.5.4.2-2: Measurement period T<sub>L1-RSRP\_Measurement\_Period\_CSI-RS</sub> for FR2

Conf	T <sub>L1-RSRP_Measurement_Period_CSI-RS</sub> (ms)				
non-DRX		max(T <sub>Report</sub> , ceil(M*P*N)*T <sub>CSI-RS</sub> )			
DRX cycle ≤ 320ms		max(T <sub>Report</sub> , ceil(1.5*M*P*N)*max(T <sub>DRX</sub> ,T <sub>CSI-RS</sub> ))			
DRX cy	cle > 320ms	ceil(M*P*N)*T <sub>DRX</sub>			
Note 1:	T <sub>CSI-RS</sub> is the	periodicity of CSI-RS configured for L1-RSRP			
Note 2:	periodicity for the requireme	t. T <sub>DRX</sub> is the DRX cycle length. T <sub>Report</sub> is configured reporting. ents are applicable provided that the CSI-RS resource r L1-RSRP measurement is transmitted with Density =			
	3.				

# 9.5.5 Measurement restriction for CSI-RS and SSB for L1-RSRP measurement

The UE is required to be capable of measuring SSB and CSI-RS for L1-RSRP without measurement gaps. The UE is required to perform the SSB and CSI-RS measurements with measurement restrictions as described in the following clauses.

#### 9.5.5.1 Measurement restriction for SSB based L1-RSRP

For FR1, when the SSB for L1-RSRP measurement is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD or L1-RSRP measurement.

- If SSB and CSI-RS have same SCS, UE shall be able to measure the SSB for L1-RSRP measurement without any restriction;
- If SSB and CSI-RS have different SCS,
  - If UE supports simultaneousRxDataSSB-DiffNumerology, UE shall be able to measure the SSB for L1-RSRP measurement without any restriction;
  - If UE does not support simultaneousRxDataSSB-DiffNumerology, UE is required to measure one of but not both SSB for L1-RSRP measurement and CSI-RS. Longer measurement period for SSB based L1-RSRP measurement is expected, and no requirements are defined.

For FR2, when the SSB for L1-RSRP measurement is in the same OFDM symbol as CSI-RS for RLM, BFD, CBD or L1-RSRP measurement, UE is required to measure one of but not both SSB for L1-RSRP measurement and CSI-RS. Longer measurement period for SSB based L1-RSRP measurement is expected, and no requirements are defined.

#### 9.5.5.2 Measurement restriction for CSI-RS based L1-RSRP

For both FR1 and FR2, when the CSI-RS for L1-RSRP measurement is in the same OFDM symbol as SSB for RLM, BFD, CBD or L1-RSRP measurement, UE is not required to receive CSI-RS for L1-RSRP measurement in the PRBs that overlap with an SSB.

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

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

- If the UE supports *simultaneousRxDataSSB-DiffNumerology* the UE shall be able to perform CSI-RS measurement without restrictions.
- If the UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both CSI-RS for L1-RSRP measurement and SSB. Longer measurement period for CSI-RS based L1-RSRP measurement is expected, and no requirements are defined.

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

For FR2, when the CSI-RS for L1-RSRP measurement is in the same OFDM symbol as SSB for RLM, BFD or L1-RSRP measurement, or in the same symbol as SSB for CBD when beam failure is detected, UE is required to measure one of but not both CSI-RS for L1-RSRP measurement and SSB. Longer measurement period for CSI-RS based L1-RSRP measurement is expected, and no requirements are defined.

For FR2, when the CSI-RS for L1-RSRP measurement is in the same OFDM symbol as another CSI-RS for RLM, BFD, CBD or L1-RSRP measurement,

- In the following cases, UE is required to measure one of but not both CSI-RS for L1-RSRP measurement and the
  other CSI-RS. Longer measurement period for CSI-RS based L1-RSRP measurement is expected, and no
  requirements are defined.
  - The CSI-RS for L1-RSRP measurement or the other CSI-RS in a resource set configured with repetition ON, or
  - The other CSI-RS is configured in q1 and beam failure is detected, or
  - The two CSI-RS-es are not QCL-ed w.r.t. QCL-TypeD, or the QCL information is not known to UE,
- Otherwise, UE shall be able to measure the CSI-RS for L1-RSRP measurement without any restriction.

# 9.5.6 Scheduling availability of UE during L1-RSRP measurement

Scheduling availability restrictions when the UE is performing L1-RSRP measurement are described in the following clauses.

# 9.5.6.1 Scheduling availability of UE performing L1-RSRP measurement with a same subcarrier spacing as PDSCH/PDCCH on FR1

There are no scheduling restrictions due to L1-RSRP measurement performed on SSB and CSI-RS configured as RS for L1-RSRP measurement with the same SCS as PDSCH/PDCCH in FR1.

# 9.5.6.2 Scheduling availability of UE performing L1-RSRP measurement with a different subcarrier spacing than PDSCH/PDCCH on FR1

For UEs which support *simultaneousRxDataSSB-DiffNumerology* [14] there are no restrictions on scheduling availability due to L1-RSRP measurement based on SSB as RS for L1-RSRP measurement. For UEs which do not support *simultaneousRxDataSSB-DiffNumerology* [14] the following restrictions apply due to L1-RSRP measurement based on SSB configured for L1-RSRP measurement.

- The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/CSI-RS for tracking /CSI-RS for CQI on SSB symbols to be measured for L1-RSRP measurement.

When intra-band carrier aggregation in FR1 is configured, the scheduling restrictions on serving cell where L1-RSRP measurement is performed apply to all serving cells in the same band on the symbols that fully or partially overlap with restricted symbols. When inter-band carrier aggregation within FR1 is configured, there are no scheduling restrictions on FR1 serving cell(s) configured in other bands than the bands in which the serving cell where L1-RSRP measurement is performed is configured.

## 9.5.6.3 Scheduling availability of UE performing L1-RSRP measurement on FR2

The following scheduling restriction applies due to L1-RSRP measurement.

- For the case where RS for L1-RSRP measurement is CSI-RS which is QCLed with active TCI state for PDCCH/PDSCH and not in a CSI-RS resource set with repetition ON, and N=1 applies as specified in clause 9.4.5.2
  - There are no scheduling restrictions due to L1-RSRP measurement performed based on the CSI-RS.
- Otherwise
  - The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/CSI-RS for tracking/CSI-RS for CQI on RS for L1-RSRP measurement symbols to be measured for L1-RSRP measurement.

When intra-band carrier aggregation is performed, the scheduling restrictions on serving cell where L1-RSRP measurement is performed apply to all serving cells in the band on the symbols that fully or partially overlap with restricted symbols.

If following conditions are met,

- UE has been notified about system information update through paging,
- The gap between UE's reception of PDCCH that UE monitors in the Type 2-PDCCH CSS set and that notifies system information update, and the PDCCH that UE monitors in the Type0-PDCCH CSS set, is greater than [2] slots,

For the SSB and CORESET for RMSI scheduling multiplexing patterns 3, UE is expected to receive the PDCCH that UE monitors in the Type0-PDCCH CSS set, and the corresponding PDSCH, on SSB symbols to be measured for L1-RSRP measurement; and

For the SSB and CORESET for RMSI scheduling multiplexing patterns 2, UE is expected to receive PDSCH that corresponds to the PDCCH that UE monitors in the Type0-PDCCH CSS set, on SSB symbols to be measured for L1-RSRP measurement.

# 9.5.6.4 Scheduling availability of UE performing L1-RSRP measurement on FR1 or FR2 in case of FR1-FR2 inter-band CA

There are no scheduling restrictions on FR1 serving cell(s) due to L1-RSRP measurement performed on FR2 serving cell(s).

There are no scheduling restrictions on FR2 serving cell(s) due to L1-RSRP measurement performed on FR1 serving cell(s).

## 9.6 NE-DC: Measurements

## 9.6.1 Introduction

This clause contains requirements for UE supporting dual connectivity with NR PCell and E-UTRA FDD or TDD PSCell. The requirements apply to UEs that have been configured with NE-DC.

#### 9.6.2 SFTD Measurements

#### 9.6.2.1 Introduction

This clause contains requirements on UE capabilities for reporting of SFN and frame time difference between NR PCell and E-UTRA PSCell in RRC\_CONNECTED state. The requirements comprise measurement reporting delay and measurement accuracy. The overall measurement reporting delay includes a RRC procedure delay specified in TS 38.331 [2], and the SFTD measurement reporting delay specified below.

### 9.6.2.2 SFTD Measurement requirements

When no DRX is used in either of the NR PCell and E-UTRA PSCell, the physical layer measurement period of the SFTD measurement shall be  $T_{measure\_SFTD1} = max(0.2,[5] * SMTC period)$  s.

When DRX is used in either of the NR PCell or the E-UTRA PSCell, or in both PCell and PSCell, the physical layer measurement period ( $T_{measure\_SFTD1}$ ) of the SFTD measurement shall be as specified in Table 9.6.2.2-1.

Table 9.6.2.2-1: SFTD measurement requirement when DRX is used

DRX cycle length (s) <sup>Note2</sup>	T <sub>measure_</sub> SFTD1 (s)		
DRX cycle≤0.04	max(0.2,5 x SMTC period) (Note1)		
0.04 <drx cycle≤0.32<="" td=""><td>8 x max(DRX cycle, SMTC period)</td></drx>	8 x max(DRX cycle, SMTC period)		
0.32 <drx 5="" cycle<="" cycle≤10.24="" drx="" td="" x=""></drx>			
Note2: DRX cycle length in this tab configured for PCell or PSC	ends upon the DRX cycle in use le refers to the DRX cycle length ell. When DRX is used in both PCell and this table refers to the longer of the DRX PSCell.		

If PSCell is changed without changing carrier frequency of PSCell while the UE is performing SFTD measurements, the UE shall still meet SFTD measurement and accuracy requirements for the new PSCell. In this case the UE shall restart the SFTD measurement, and the total physical layer measurement period shall not exceed T<sub>measure\_SFTD2</sub> as defined by the following expression:

$$T_{\text{measure SFTD2}} = (M+1)*(T_{\text{measure SFTD1}}) + M*T_{\text{PSCell change NEDC}}$$

where:

M is the number of times the E-UTRA PSCell is changed over the measurement period (T<sub>measure SFTD2</sub>), and

T<sub>PSCell change NEDC</sub> is the time necessary to change the PSCell; it can be up to 25 ms.

If PCell is changed, or if PSCell is changed to a different carrier frequency, the UE shall terminate the SFTD measurement.

The measurement accuracy for the SFTD measurement when DRX is used as well as when no DRX is used shall be as specified in clause 10.1.21.1.

# 10 Measurement Performance requirements

## 10.1 NR measurements

#### 10.1.1 Introduction

The requirements in clause 10.1 apply as follows:

- intra-frequency requirements apply for PCell measurements in SA, NR-DC, or NE-DC operaion mode,
- intra-frequency requirements apply for PSCell measurements in NR-DC or EN-DC operaion mode,

- intra-frequency requirements apply for SCell measurements in SA operation mode with NR CA or any MR-DC operation mode with NR CA,
- inter-frequency requirements apply for non-serving cell measurements on NR carrier frequencies.

In the requirements of clause 10.1, the exceptions for side conditions apply as follows:

- for the UE capable of CA but not configured with any SCell, the applicable exceptions for side conditions are specified in Annex B, clause B.3.2.1 for UE supporting CA in FR1, and clause B.3.2.3 for UE supporting CA in FR2, respectively;
- for the UE capable of CA and configured with at least one SCell, the applicable exceptions for side conditions are specified in Annex B, clause B.3.2.2 for UE configured with CA in FR1, and clause B.3.2.4 for UE supporting CA in FR2 respectively;
- for the UE capable of SUL but not configured with SUL, the applicable exceptions for side conditions are specified in Annex B, clause B.3.4.1 for UE supporting SUL in FR1;
- for the UE capable of SUL and configured with at least one SUL, the applicable exceptions for side conditions are specified in Annex B, clause B.3.4.2 for UE configured with SUL in FR1.

# 10.1.2 Intra-frequency RSRP accuracy requirements for FR1

## 10.1.2.1 Intra-frequency SS-RSRP accuracy requirements

## 10.1.2.1.1 Absolute SS-RSRP Accuracy

Unless otherwise specified, the requirements for absolute accuracy of SS-RSRP in this clause apply to a cell on the same frequency as that of the serving cell in FR1.

The accuracy requirements in Table 10.1.2.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each relevant SSB.

Table 10.1.2.1.1-1: SS-RSRP Intra frequency absolute accuracy in FR1

Accı	ıracy			Condition			
Normal	Extreme	SSB		lo Note	<sup>1</sup> range		
condition			NR operating band groups		Minimur	n lo	Maximum lo
		dB		dBm / S	CS <sub>SSB</sub>		
dB	dB			SCS <sub>SSB</sub> = 15 kHz	SCS <sub>SSB</sub> = 30 kHz	dBm/BWchannel	dBm/BWchannel
		NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	N/A	-70	
	±4.5 ±9	≥-6 dB	NR_FDD_FR1_B	-120.5	-117.5	N/A	-70
			NR_TDD_FR1_C	-120	-117	N/A	-70
±4.5			NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	N/A	-70
				NR_FDD_FR1_E, NR TDD FR1 E	-119	-116	N/A
			NR FDD FR1 G	-118	-115	N/A	-70
			NR_FDD_FR1_H	-117.5	-114.5	N/A	-70
±8	±11	≥-6 dB	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A, NR_FDD_FR1_B, NR_TDD_FR1_C, NR_FDD_FR1_D, NR_TDD_FR1_D, NR_FDD_FR1_E, NR_TDD_FR1_E, NR_TDD_FR1_G, NR_FDD_FR1_G, NR_FDD_FR1_G,	N/A	N/A	-70	-50

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.

NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2.

## 10.1.2.1.2 Relative SS-RSRP Accuracy

The relative accuracy of SS-RSRP is defined as the SS-RSRP measured from one cell compared to the SS-RSRP measured from another cell on the same frequency, or between any two SS-RSRP levels measured on the same cell in FR1.

The accuracy requirements in Table 10.1.2.1.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each relevant SSB.

Table 10.1.2.1.2-1: SS-RSRP Intra frequency relative accuracy in FR1

Accı	ıracy			Condit				
Normal	Extreme	SSB	lo <sup>Note 1</sup> range					
condition condition	Ês/lot Note 2	NR operating band groups Note 4		Minimum		Maximum Io		
		dB		dBm /	SCS <sub>SSB</sub>			
dB dB			SCS <sub>SSB</sub> = 15 kHz	SCS <sub>SSB</sub> = 30 kHz	dBm/BW <sub>Channel</sub>	dBm/BW <sub>Channel</sub>		
			NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	N/A	-50	
			NR_FDD_FR1_B	-120.5	-117.5	N/A	-50	
			NR_TDD_FR1_C	-120	-117	N/A	-50	
±2	±2 ±3	3 ≥-3 dB	NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	N/A	-50	
		NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	N/A	-50		
		NR_FDD_FR1_G	-118	-115	N/A	-50		
			NR_FDD_FR1_H	-117.5	-114.5	N/A	-50	
±3	±3	≥-6 dB	Note 3	Note 3	Note 3	N/A	Note 3	

- NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
- NOTE 2: The parameter SSB Ês/lot is the minimum SSB Ês/lot of the pair of cells to which the requirement applies.
- NOTE 3: The same bands and the same lo conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.
- NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.

#### 10.1.2.2 Void

# 10.1.3 Intra-frequency RSRP accuracy requirements for FR2

## 10.1.3.1 Intra-frequency SS-RSRP accuracy requirements

## 10.1.3.1.1 Absolute SS-RSRP Accuracy

Unless otherwise specified, the requirements for absolute accuracy of SS-RSRP in this clause apply to a cell on the same frequency as that of the serving cell in FR2.

The accuracy requirements in Table 10.1.3.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each relevant SSB.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

Table 10.1.3.1.1-1: SS-RSRP Intra frequency absolute accuracy in FR2

condition cond	treme ndition	SSB Ês/lot			o <sup>Note 2</sup> range		
	ndition	Ês/lot					
				Minimum	lo	Maximum Io	
			dBm / SCS <sub>SSB</sub> Note 1				
dB dB	dB	dB	SCS <sub>SSB</sub> = 120kHz	SCS <sub>SSB</sub> = 240kHz	dBm/BW <sub>Channel</sub>	dBm/BW <sub>Channel</sub>	
±6 ±	±9	≥-6	Same value as SSB_RP in Table B.2.2-2, according to UE Power class, operating band and angle of arrival		N/A	-70	
±8 ±	±11		N/	'A	-70	-50	

Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of

TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.

Note 2: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.

Note 3: In the test cases, the SSB Ês/lot and related parameters may need to be adjusted to ensure Ês/lot at UE baseband is above the value defined in this table.

#### 10.1.3.1.2 Relative SS-RSRP Accuracy

The relative accuracy of SS-RSRP is defined as the SS-RSRP measured from one cell compared to the SS-RSRP measured from another cell on the same frequency, or between any two SS-RSRP levels measured on the same cell in FR2.

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each relevant SSB.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

Table 10.1.3.1.2-1: SS-RSRP Intra frequency relative accuracy in FR2

Acci	uracy		Co	nditions	
Normal	Extreme	SSB	lo <sup>Note 2</sup> range		
condition	condition	Ês/lot	Minim	ium lo	Maximum lo
			dBm / SC	S <sub>SSB</sub> Note 1	
dB	dB	dB	SCS <sub>SSB</sub> = 120kHz	SCS <sub>SSB</sub> = 240kHz	dBm/BW <sub>Channel</sub>
±6	±9	≥-6	Same value as SSB_RP in Table B.2.2-2, according to UE Power class, operating band and angle of arrival		-50
c s	alues based o lauses 7.3.2 ar elected depend o specified at the	nd 7.3.4 of TS ding on angle	38.101-2 [19] of arrival.	]. Applicable s	
а	cross the band	width.			
a th	djusted to ensi iis table.	ure Ês/lot at U	E baseband i	s above the v	may need to be alue defined in
	he parameter hich the requir			SSB Ês/lot of	the pair of cells to

#### 10.1.3.2 Void

# 10.1.4 Inter-frequency RSRP accuracy requirements for FR1

### 10.1.4.1 Inter-frequency SS-RSRP accuracy requirements

#### 10.1.4.1.1 Absolute Accuracy of SS-RSRP in FR1

The requirements for absolute accuracy of SS-RSRP in this clause apply to a cell on a frequency in FR1 that has different carrier frequency from the serving cell.

The accuracy requirements in Table 10.1.4.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB.

Table 10.1.4.1.1-1: SS-RSRP Inter frequency Absolute accuracy in FR1

Accı	ıracy			Condit			
Normal	Extreme	SSB		lo <sup>N</sup>	<sup>lote 1</sup> range		
condition	condition	Ês/lot Note 2	NR operating band groups Note 3		Minimum	lo	Maximum lo
		dB		dBm /	SCS <sub>SSB</sub>		
dB	dB			SCS <sub>SSB</sub> = 15 kHz	SCS <sub>SSB</sub> = 30 kHz	dBm/BW <sub>Channel</sub>	dBm/BW <sub>Channel</sub>
			NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	N/A	-70
			NR_FDD_FR1_B	-120.5	-117.5	N/A	-70
		≥-6 dB	NR_TDD_FR1_C	-120	-117	N/A	-70
±4.5	±4.5 ±9		NR_FDD_FR1_D, NR TDD FR1 D	-119.5	-116.5	N/A	-70
			NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	N/A	-70
			NR_FDD_FR1_G	-118	-115	N/A	-70
			NR_FDD_FR1_H	-117.5	-114.5	N/A	-70
±8	±11	≥-6 dB	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A, NR_FDD_FR1_B, NR_TDD_FR1_D, NR_FDD_FR1_D, NR_TDD_FR1_E, NR_TDD_FR1_E, NR_TDD_FR1_E, NR_TDD_FR1_G, NR_FDD_FR1_G, NR_FDD_FR1_G,	N/A	N/A	-70	-50

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.

NOTE 2: Void

NOTE 3: NR operating band groups in FR1 are as defined in clause 3.5.2.

#### 10.1.4.1.2 Relative Accuracy of SS-RSRP in FR1

The relative accuracy of SS-RSRP in inter frequency case is defined as the RSRP measured from one cell on a frequency in FR1compared to the RSRP measured from another cell on a different frequency in FR1.

The accuracy requirements in Table 10.1.4.1.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] Clause 7.3 for reference sensitivity are fulfilled.

- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB.
- $|SSB_RP1_{dBm} SSB_RP2_{dBm}| \leq 27 \text{ dB}$
- | Channel 1 Io -Channel 2 Io |  $\leq$  20 dB

Table 10.1.4.1.2-1: SS-RSRP Inter frequency relative accuracy in FR1

Accı	ıracy			Condition				
Normal Extreme		SSB		<sup>1</sup> range				
condition condition	Ês/lot Note 2	NR operating band groups		Minimur	n lo	Maximum lo		
		dB		dBm / S	CS <sub>SSB</sub>			
dB	dB			SCS <sub>SSB</sub> = 15 kHz	SCS <sub>SSB</sub> = 30 kHz	dBm/BWchannel	dBm/BWchannel	
				NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	N/A	-50
			NR_FDD_FR1_B	-120.5	-117.5	N/A	-50	
			NR_TDD_FR1_C	-120	-117	N/A	-50	
±4.5	±4.5 ±6	±6 ≥-6 dB	NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	N/A	-50	
			NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	N/A	-50	
			NR_FDD_FR1_G	-118	-115	N/A	-50	
			NR_FDD_FR1_H	-117.5	-114.5	N/A	-50	

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.

NOTE 2: The parameter SSB Ês/lot is the minimum SSB Ês/lot of the pair of cells to which the requirement applies.

NOTE 3: NR operating band groups in FR1 are as defined in clause 3.5.2.

#### 10.1.4.2 Void

# 10.1.5 Inter-frequency RSRP accuracy requirements for FR2

## 10.1.5.1 Inter-frequency SS-RSRP accuracy requirements

#### 10.1.5.1.1 Absolute SS-RSRP Accuracy

Unless otherwise specified, the requirements for absolute accuracy of SS-RSRP in this clause apply to a cell on a frequency in FR2 that is on a different frequency than the serving cell.

The accuracy requirements in Table 10.1.5.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

-50

**Accuracy Conditions** lo Note 2 range SSB **Normal Extreme** condition condition Ês/lot Minimum Io Maximum lo dBm / SCS<sub>SSB</sub> Note 1 dBm/BW<sub>Channel</sub> dB dB dB SCS<sub>SSB</sub> = dBm/BW<sub>Channel</sub> SCS<sub>SSB</sub> = 120kHz 240kHz Same value as SSB RP in Table B.2.3-2, according to UE Power N/A -70 ±6 ±9 ≥-4 class, operating band and angle of arrival

Table 10.1.5.1.1-1: SS-RSRP Inter frequency absolute accuracy in FR2

Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.

N/A

-70

Note 2: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth. Note 3: In the test cases, the SSB £s/lot and related parameters may need to be adjusted to ensure

Ês/lot at UE baseband is above the value defined in this table.

#### 10.1.5.1.2 Relative SS-RSRP Accuracy

±11

±8

The relative accuracy of SS-RSRP is defined as the SS-RSRP measured from one cell on a frequency in FR2 compared to the SS-RSRP measured from another cell on another frequency in FR2.

The accuracy requirements in Table 10.1.5.1.2-1 are valid under the following conditions:

- Conditions defined in 38.101-2 [19] Clause 7.3 for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB.
- $|SSB RP1_{dBm} SSB RP2_{dBm}| \leq 27dB$
- | Channel 1 Io -Channel 2 Io |  $\leq$  20 dB
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

Table 10.1.5.1.2-1: SS-RSRP Inter frequency relative accuracy in FR2

Accı	ıracy		Co	nditions	
Normal	Extreme	SSB		lo <sup>Note 2</sup> range	е
condition	condition	Ês/lot	Minim	ium lo	Maximum lo
			dBm / SC	Sss Note 1	
dB	dB	dB	SCS <sub>SSB</sub> =	SCS <sub>SSB</sub> =	dBm/BW <sub>Channel</sub>
			120kHz	240kHz	
			Same value a		
+6	+9	≥-4		, according to	-50
<u>-</u> 0	<u>-5</u>		UE Power class, operating		-00
				gle of arrival	
			and EIS spherio		
			TS 38.101-2 [19	9]. Applicable si	de condition
	selected depe				
	•		ce point, and as	sumed to have	constant EPRE
-	across the ba		<b>^</b> "		
					may need to be
	•	isure Es/lot a	t UE baseband	is above the va	ilue defined in
_	his table.	00D Ê // /		00D Ê //	
	•			SSB Es/lot of t	he pair of cells to
\	which the requ	urement app	iles.		

10.1.5.2 Void

# 10.1.6 RSRP Measurement Report Mapping

The reporting range of SS-RSRP for L3 reporting is defined from -156 dBm to -31 dBm with 1 dB resolution. The reporting range of SS-RSRP and CSI-RSRP for L1 reporting is defined from -140 to -44 dBm with 1 dB resolution.

The mapping of measured quantity is defined in Table 10.1.6.1-1. The range in the signalling may be larger than the guaranteed accuracy range.

The reporting range of differential SS-RSRP and CSI-RSRP for L1 reporting is defined from 0 dBm to -30 dB with 2 dB resolution.

The mapping of measured quantity is defined in Table 10.1.6.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

Table 10.1.6.1-1: SS-RSRP and CSI-RSRP measurement report mapping

Reported value	Measured quantity value (L3 SS-RSRP)	Measured quantity value (L1 SS-RSRP and CSI-RSRP)	Unit	
RSRP_0	SS-RSRP<-156	Not valid	dBm	
RSRP_1	-156≤ SS-RSRP<-155	Not valid	dBm	
RSRP_2	-155≤ SS-RSRP<-154	Not valid	dBm	
RSRP_3	-154≤ SS-RSRP<-153	Not valid	dBm	
RSRP_4	-153≤ SS-RSRP<-152	Not valid	dBm	
RSRP_5	-152≤ SS-RSRP<-151	Not valid	dBm	
RSRP_6	-151≤ SS-RSRP<-150	Not valid	dBm	
RSRP_7	-150≤ SS-RSRP<-149	Not valid	dBm	
RSRP_8	-149≤ SS-RSRP<-148	Not valid	dBm	
RSRP_9	-148≤ SS-RSRP<-147	Not valid	dBm	
RSRP_10	-147≤ SS-RSRP<-146	Not valid	dBm	
RSRP_11	-146≤ SS-RSRP<-145	Not valid	dBm	
RSRP_12	-145≤ SS-RSRP<-144	Not valid	dBm	
RSRP_13	-144≤ SS-RSRP<-143	Not valid	dBm	
RSRP_14	-143≤ SS-RSRP<-142	Not valid	dBm	
RSRP_15	-142≤ SS-RSRP<-141	Not valid	dBm	
RSRP_16	-141≤ SS-RSRP<-140	RSRP<-140	dBm	
RSRP_17	-140≤ SS-RSRP<-139	-140≤RSRP<-139	dBm	
RSRP_18	-139≤ SS-RSRP<-138	-139≤ RSRP<-138	dBm	
RSRP_111	-46≤ SS-RSRP<-45	-46≤ RSRP<-45	dBm	
RSRP_112	-45≤ SS-RSRP<-44	-45≤ RSRP<-44	dBm	
RSRP_113	-44≤ SS-RSRP<-43	-44≤ RSRP	dBm	
RSRP_114	-43≤ SS-RSRP<-42	Not valid	dBm	
RSRP_115	-42≤ SS-RSRP<-41	Not valid	dBm	
RSRP_116	-41≤ SS-RSRP<-40	Not valid	dBm	
RSRP_117	-40≤ SS-RSRP<-39	Not valid	dBm	
RSRP_118	-39≤ SS-RSRP<-38	Not valid	dBm	
RSRP_119	-38≤ SS-RSRP<-37	Not valid	dBm	
RSRP_120	-37≤ SS-RSRP<-36	Not valid	dBm	
RSRP_121	-36≤ SS-RSRP<-35	Not valid	dBm	
RSRP_122	-35≤ SS-RSRP<-34	Not valid	dBm	
RSRP_123	-34≤ SS-RSRP<-33	Not valid	dBm	
RSRP_124	-33≤ SS-RSRP<-32	Not valid	dBm	
RSRP_125	-32≤ SS-RSRP<-31	Not valid	dBm	
RSRP_126	-31≤ SS-RSRP	Not valid	dBm	
RSRP_127 (Note)	Infinity	Infinity	dBm	

the value of RSRP\_127 is applicable for RSRP threshold configured by the network as defined in TS 38.331 [2], but not for the purpose of measurement reporting.

Table 10.1.6.1-2: Differential SS-RSRP and CSI-RSRP measurement (for L1 reporting) report mapping

Reported value	Measured quantity value (difference in measured RSRP from strongest RSRP)	Unit
DIFFRSRP_0	0 ≥ △ RSRP>-2	dB
DIFFRSRP_1	-2≥ ∆ RSRP>-4	dB
DIFFRSRP_2	-4≥ ∆ RSRP>-6	dB
DIFFRSRP_3	-6≥ ∆ RSRP>-8	dB
DIFFRSRP_4	-8≥ ∆ RSRP>-10	dB
DIFFRSRP_5	-10 ≥ ∆ RSRP>-12	dB
DIFFRSRP_6	-12≥ ∆ RSRP>-14	dB
DIFFRSRP_7	-14 ≥ ∆ RSRP>-16	dB
DIFFRSRP_8	-16 ≥ ∆ RSRP>-18	dB
DIFFRSRP_9	-18 ≥ △ RSRP>-20	dB
DIFFRSRP_10	-20 ≥ ∆ RSRP>-22	dB
DIFFRSRP_11	-22≥ ∆ RSRP>-24	dB
DIFFRSRP_12	-24 ≥ ∆ RSRP>-26	dB
DIFFRSRP_13	-26 ≥ ∆ RSRP>-28	dB
DIFFRSRP_14	-28 ≥ ∆ RSRP>-30	dB
DIFFRSRP_15	-30 ≥ ∆ RSRP	dB

# 10.1.7 Intra-frequency RSRQ accuracy requirements for FR1

# 10.1.7.1 Intra-frequency SS-RSRQ accuracy requirements in FR1

## 10.1.7.1.1 Absolute SS-RSRQ Accuracy in FR1

Unless otherwise specified, the requirements for absolute accuracy of SS-RSRQ in this clause apply to a cell on the same frequency as that of the serving cell in FR1.

The accuracy requirements in Table 10.1.7.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each relevant SSB.

Table 10.1.7.1.1-1: SS-RSRQ Intra frequency absolute accuracy in FR1

Accı	ıracy			Conditions				
Normal	Extreme	SSB	lo <sup>Note 1</sup> range					
condition	condition	Ês/lot	NR operating band groups Note 3		Minimum Io		Maximum lo	
		dB		dBm /	SCS <sub>SSB</sub>			
dB	dB			SCS <sub>SSB</sub> = 15 kHz	SCS <sub>SSB</sub> = 30 kHz	dBm/BW <sub>Channel</sub>	dBm/BW <sub>Channel</sub>	
			NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	N/A	-50	
			NR_FDD_FR1_B	-120.5	-117.5	N/A	-50	
			NR_TDD_FR1_C	-120	-117	N/A	-50	
±2.5	±4	±4 ≥-3 dB	NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	N/A	-50	
			NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	N/A	-50	
			NR_FDD_FR1_G	-118	-115	N/A	-50	
			NR_FDD_FR1_H	-117.5	-114.5	N/A	-50	
±3.5	±4	≥-6 dB	Note 2	Note 2	Note 2	Note 2	Note 2	

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.

NOTE 2: The same bands and the same lo conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.

NOTE 3: NR operating band groups in FR1 are as defined in clause 3.5.2.

# 10.1.8 Intra-frequency RSRQ accuracy requirements for FR2

## 10.1.8.1 Intra-frequency SS-RSRQ accuracy requirements in FR2

#### 10.1.8.1.1 Absolute SS-RSRQ Accuracy in FR2

Unless otherwise specified, the requirements for absolute accuracy of SS-RSRQ in this clause apply to a cell on the same frequency as that of the serving cell in FR2.

The accuracy requirements in Table 10.1.8.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each relevant SSB.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

Table 10.1.8.1.1-1: SS-RSRQ Intra frequency absolute accuracy in FR2

Ac	curacy		Conditions				
Normal	Extreme	SSB	lo Note 2 range		e		
condition	condition	Ês/lot	Minim	ium lo	Maximum lo		
			dBm / SC	S <sub>SSB</sub> Note 1			
dB	dB	dB	SCS <sub>SSB</sub> = 120kHz	SCS <sub>SSB</sub> = 240kHz	dBm/BW <sub>Channel</sub>		
±2.5	±4	<b>≥-3</b>	Same value as SS B.2.2-2, according	-50			
±3.5	±4	≥-6	class, operating ba arrival	-50			
Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.							
Note 2: Note 3:	lo specified at th In the test cases	ne Reference p s, the SSB Ês/	point, and assumed	to have constant EPI meters may need to	RE across the bandwidth. be adjusted to ensure		

# 10.1.9 Inter-frequency RSRQ accuracy requirements for FR1

## 10.1.9.1 Inter-frequency SS-RSRQ accuracy requirements in FR1

#### 10.1.9.1.1 Aboslute Accuracy of SS-RSRQ in FR1

The requirements for absolute accuracy of SS-RSRQ in this clause apply to a cell on a frequency in FR1 that has different carrier frequency from the serving cell.

The accuracy requirements in Table 10.1.9.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB.

Table 10.1.9.1.1-1: SS-RSRQ Inter frequency absolute accuracy in FR1

Accı	ıracy			Conditions				
Normal	Extreme	SSB	lo Note 1 range					
condition	condition	Ês/lot	NR operating band groups Note 3		Minimum	lo	Maximum lo	
		dB		dBm /	SCS <sub>SSB</sub>			
dB	dB			SCS <sub>SSB</sub> = 15 kHz	SCS <sub>SSB</sub> = 30 kHz	dBm/BW <sub>Channel</sub>	dBm/BW <sub>Channel</sub>	
			NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	N/A	-50	
			NR_FDD_FR1_B	-120.5	-117.5	N/A	-50	
			NR_TDD_FR1_C	-120	-117	N/A	-50	
±2.5	±4	±4 ≥-3 dB	NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	N/A	-50	
			NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	N/A	-50	
			NR_FDD_FR1_G	-118	-115	N/A	-50	
			NR_FDD_FR1_H	-117.5	-114.5	N/A	-50	
±3.5	±4	≥-6 dB	Note 2	Note 2	Note 2	Note 2	Note 2	

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.

NOTE 2: The same bands and the same lo conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.

NOTE 3: NR operating band groups in FR1 are as defined in clause 3.5.2.

#### 10.1.9.1.2 Relative Accuracy of SS-RSRQ in FR1

The relative accuracy of SS-RSRQ in inter frequency case is defined as the RSRQ measured from one cell on a frequency in FR1 compared to the RSRP measured from another cell on a different frequency in FR1.

The accuracy requirements in Table 10.1.9.1.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB.
- $|SSB RP1_{dBm} SSB RP2_{dBm}| \leq 27 dB$
- | Channel 1\_Io -Channel 2\_Io |  $\leq$  20 dB

Table 10.1.9.1.2-1: SS-RSRQ Inter frequency relative accuracy in FR1

Accı	ıracy		Conditions					
Normal	Extreme	SSB		lo <sup>Note 1</sup> range				
condition	condition	Ês/lot Note 2	NR operating band groups Note 4		Minimum Io			
		dB		dBm /	SCS <sub>SSB</sub>			
dB	dB			SCS <sub>SSB</sub> = 15 kHz	SCS <sub>SSB</sub> = 30 kHz	dBm/BW <sub>Channel</sub>	dBm/BW <sub>Channel</sub>	
			NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	N/A	-50	
			NR_FDD_FR1_B	-120.5	-117.5	N/A	-50	
			NR_TDD_FR1_C	-120	-117	N/A	-50	
±3	±4	≥-3 dB	NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	N/A	-50	
			NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	N/A	-50	
			NR_FDD_FR1_G	-118	-115	N/A	-50	
			NR_FDD_FR1_H	-117.5	-114.5	N/A	-50	
±4	±4	≥-6 dB	Note 3	Note 3	Note 3	Note 3	Note 3	

- NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
- NOTE 2: The parameter SSB Ês/lot is the minimum SSB Ês/lot of the pair of cells to which the requirement applies.
- NOTE 3: The same bands and the same lo conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.

# 10.1.10 Inter-frequency RSRQ accuracy requirements for FR2

#### 10.1.10.1 Inter-frequency SS-RSRQ accuracy requirements in FR2

#### 10.1.10.1.1 Aboslute Accuracy of SS-RSRQ in FR2

The requirements for absolute accuracy of SS-RSRQ in this clause apply to a cell on a frequency in FR2 that has different carrier frequency from the serving cell.

The accuracy requirements in Table 10.1.10.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.

Table 10.1.10.1.1-1: SS-RSRQ Inter frequency absolute accuracy in FR2

Acc	uracy		Conditions				
Normal	Extreme	SSB		lo <sup>Note 2</sup> rang	е		
condition	condition	Ês/lot	Minim	ium lo	Maximum Io		
			dBm / SC	S <sub>SSB</sub> Note 1			
dB	dB	dB	SCS <sub>SSB</sub> = 120kHz	SCS <sub>SSB</sub> = 240kHz	dBm/BW <sub>Channel</sub>		
±2.5	±4	≥-3	Same value as SS B.2.2-2, according	-50			
±3.5	±4	≥-4	class, operating ba arrival	-30			
			EIS spherical coverside condition selecte		auses 7.3.2 and 7.3.4 of gle of arrival.		
Note 2: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.							
Note 3:	n the test cases	s, the SSB Ês <i>i</i>		meters may need to	be adjusted to ensure		

## 10.1.10.1.2 Relative Accuracy of SS-RSRQ in FR2

The relative accuracy of SS-RSRQ in inter frequency case is defined as the RSRQ measured from one cell on a frequency in FR2 compared to the RSRP measured from another cell on a different frequency in FR2.

The accuracy requirements in Table 10.1.10.1.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB.
- $|SSB_RP1_{dBm} SSB_RP2_{dBm}| \le 27 \text{ dB}$
- | Channel 1 Io -Channel 2 Io |  $\leq$  20 dB

Accuracy

- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

Table 10.1.10.1.2-1: SS-RSRQ Inter frequency relative accuracy in FR2

Conditions

Acci			Conditions				
Normal	Extreme	SSB	lo Note 2 range				
condition	condition	Ês/lot	Minim	um lo	Maximum Io		
			dBm / SC	Sss Note 1			
dB	dB	dB	SCS <sub>SSB</sub> = SCS <sub>SSB</sub> = 120kHz 240kHz		dBm/BW <sub>Channel</sub>		
±3	<u>±</u> 4	≥-3	Same value as SSB_RP in Table B.2.2-2, according to UE Power		-50		
<u>+</u> 4	±4	≥-4	class, operating ba arrival	and angle of	-50		
Note 1: V	alues based or	n Refsens and	EIS spherical cover	age as defined in cl	auses 7.3.2 and 7.3.4 of		
T.	S 38.101-2 [19	]. Applicable s	ide condition selecte	ed depending on an	gle of arrival.		
Note 2: Ic	specified at th	ne Reference p	point, and assumed t	o have constant EP	RE across the bandwidth.		
			he minimum SSB Ês				
re	equirement app	olies.		·			
Note 4: In	the test cases	s, the SSB Ês/	lot and related parar	neters may need to	be adjusted to ensure		
			e the value defined		-		

# 10.1.11 RSRQ report mapping

## 10.1.11.1 SS-RSRQ measurement report mapping

The reporting range of SS-RSRQ is defined from -43 dB to 20 dB with 0.5 dB resolution. The mapping of measured quantity is defined in Table 10.1.11.1-1. The range in the signalling may be larger than the guaranteed accuracy range.

Table 10.1.11.1-1: SS-RSRQ measurement report mapping

Reported value	Measured quantity value	Unit
SS-RSRQ_0	SS-RSRQ<-43	dB
SS-RSRQ_1	-43≤ SS-RSRQ<-42.5	dB
SS-RSRQ_2	-42.5≤ SS-RSRQ<-42	dB
SS-RSRQ_3	-42≤ SS-RSRQ<-41.5	dB
SS-RSRQ_4	-41.5≤ SS-RSRQ<-41	dB
SS-RSRQ_122	17.5≤ SS-RSRQ<18	dB
SS-RSRQ_123	18≤ SS-RSRQ<18.5	dB
SS-RSRQ_124	18.5≤ SS-RSRQ<19	dB
SS-RSRQ_125	19≤ SS-RSRQ<19.5	dB
SS-RSRQ_126	19.5≤ SS-RSRQ<20	dB
SS-RSRQ_127	20 ≤ SS-RSRQ	dB

# 10.1.12 Intra-frequency SINR accuracy requirements for FR1

## 10.1.12.1 Intra-frequency SS-SINR accuracy requirements in FR1

### 10.1.12.1.1 Absolute SS-SINR Accuracy in FR1

Unless otherwise specified, the requirements for absolute accuracy of SS-SINR in this clause apply to a cell on the same frequency as that of the serving cell in FR1.

The accuracy requirements in Table 10.1.12.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band.

Table 10.1.12.1.1-1: SS-SINR Intra frequency absolute accuracy in FR1

Accı	ıracy			Conditions					
Normal	Extreme	SSB		lo <sup>Note 1</sup> range					
condition	condition	Ês/lot Note 3	NR operating band groups <sup>Note 4</sup>	g band ote 4 Minimum Io		Maximum Io			
		dB		dBm /	SCS <sub>SSB</sub>				
dB	dB			SCS <sub>SSB</sub> = 15 kHz	SCS <sub>SSB</sub> = 30 kHz	dBm/BW <sub>Channel</sub>	dBm/BW <sub>Channel</sub>		
			NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	N/A	-50		
			NR_FDD_FR1_B	-120.5	-117.5	N/A	-50		
			NR_TDD_FR1_C	-120	-117	N/A	-50		
±3.0	±4	±4 ≥-3 dB	NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	N/A	-50		
			NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	N/A	-50		
			NR_FDD_FR1_G	-118	-115	N/A	-50		
			NR_FDD_FR1_H	-117.5	-114.5	N/A	-50		
±3.5	±4	≥-6 dB	Note 2	Note 2	Note 2	Note 2	Note 2		

NOTE 1: Io is assumed to have constant EPRE across the bandwidth.

NOTE 2: The same bands and the same lo conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.

NOTE 3: The requirements apply for SSB Ês/lot ≤ 25 dB.

NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.

# 10.1.13 Intra-frequency SINR accuracy requirements for FR2

# 10.1.13.1 Intra-frequency SS-SINR accuracy requirements in FR2

#### 10.1.13.1.1 Absolute SS-SINR Accuracy in FR2

Unless otherwise specified, the requirements for absolute accuracy of SS-SINR in this clause apply to a cell on the same frequency as that of the serving cell in FR2.

The accuracy requirements in Table 10.1.13.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

Table 10.1.13.1.1-1: SS-SINR Intra frequency absolute accuracy in FR2

Acc	uracy		Conditions SB Io Note 2 range						
Normal	Extreme	SSB		je					
condition	condition	Ês/lot		um lo	Maximum Io				
			dBm / SC	S <sub>SSB</sub> Note 1					
dB	dB	dB	SCS <sub>SSB</sub> = SCS <sub>SSB</sub> = 120kHz 240kHz		dBm/BW <sub>Channel</sub>				
±3	±4	≥-3	Same value as SSB_RP in Table B.2.2-2, according to UE Power class, operating band and angle of arrival		B 2 2-2 according to LIF Power		-50		
±3.5	±4	≥-6			class, operating band and angle of		-50		
					lauses 7.3.2 and 7.3.4 of				
			side condition selecte						
					PRE across the bandwidth.				
					be adjusted to ensure				
É	Ês/lot at UE baseband is above the value defined in this table.								
Note 4: T	he requiremen	ts apply for SS	SB Ês/lot ≤ 25 dB.						

# 10.1.14 Inter-frequency SINR accuracy requirements for FR1

## 10.1.14.1 Inter-frequency SS-SINR accuracy requirements in FR1

#### 10.1.14.1.1 Aboslute Accuracy of SS-SINR in FR1

The requirements for absolute accuracy of SS-SINR in this clause apply to a cell on a frequency in FR1 that has different carrier frequency from the serving cell.

The accuracy requirements in Table 10.1.14.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band.

Table 10.1.14.1.1-1: SS-SINR Inter frequency absolute accuracy in FR1

Accı	ıracy			Condit				
Normal	Extreme	SSB	lo <sup>Note 1</sup> range					
condition	condition	Ês/lot Note 3	NR operating band groups Note 4		Minimum Io		Maximum Io	
		dB		dBm /	SCS <sub>SSB</sub>			
dB	dB			SCS <sub>SSB</sub> = 15 kHz	SCS <sub>SSB</sub> = 30 kHz	dBm/BW <sub>Channel</sub>	dBm/BW <sub>Channel</sub>	
			NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	N/A	-50	
			NR_FDD_FR1_B	-120.5	-117.5	N/A	-50	
			NR_TDD_FR1_C	-120	-117	N/A	-50	
±3.0	±4	±4 ≥-3 dB	NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	N/A	-50	
			NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	N/A	-50	
			NR_FDD_FR1_G	-118	-115	N/A	-50	
			NR_FDD_FR1_H	-117.5	-114.5	N/A	-50	
±3.5	±4	≥-6 dB	Note 2	Note 2	Note 2	Note 2	Note 2	

- NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
- NOTE 2: The same bands and the same lo conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.
- NOTE 3: The requirements apply for SSB Ês/lot ≤ 25 dB.
- NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.

#### 10.1.14.1.2 Relative Accuracy of SS-SINR in FR1

The relative accuracy of SS-SINR in inter frequency case is defined as the SS-SINR measured from one cell on a frequency in FR1 compared to the SS-SINR measured from another cell on a different frequency in FR1.

The accuracy requirements in Table 10.1.14.1.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band.
- $|SSB RP1_{dBm} SSB RP2_{dBm}| \leq 27 dB$
- | Channel 1\_Io -Channel 2\_Io |  $\leq$  20 dB

Table 10.1.14.1.2-1: SS-SINR Inter frequency relative accuracy in FR1

Accı	ıracy			Conditions				
Normal	Evtromo	SSB		lo	Note 1 range			
condition	Extreme condition	Ês/lot Note 2,4	NR operating band groups Note 5		Minimum Io			
		dB		dBm / S	SCS <sub>SSB</sub>			
dB	dB			SCS <sub>SSB</sub> = 120 kHz			dBm/BW <sub>Channel</sub>	
			NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	N/A	-50	
			NR_FDD_FR1_B	-120.5	-117.5	N/A	-50	
			NR_TDD_FR1_C	-120	-117	N/A	-50	
±3.5	±4	≥-3 dB	NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	N/A	-50	
			NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	N/A	-50	
			NR_FDD_FR1_G	-118	-115	N/A	-50	
			NR_FDD_FR1_H	-117.5	-114.5	N/A	-50	
±4	±4	≥-6 dB	Note 3	Note 3	Note 3	Note 3	Note 3	

- NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
- NOTE 2: The parameter SSB Ês/lot is the minimum SSB Ês/lot of the pair of cells to which the requirement applies.
- NOTE 3: The same bands and the same lo conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.
- NOTE 4: The requirements apply for SSB Ês/lot ≤ [25] dB.
- NOTE 5: NR operating band groups in FR1 are as defined in clause 3.5.2.

### 10.1.15 Inter-frequency SINR accuracy requirements for FR2

#### 10.1.15.1 Inter-frequency SS-SINR accuracy requirements in FR2

#### 10.1.15.1.1 Aboslute Accuracy of SS-SINR in FR2

The requirements for absolute accuracy of SS-SINR in this clause apply to a cell on a frequency in FR2 that has different carrier frequency from the serving cell.

The accuracy requirements in Table 10.1.15.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

Table 10.1.15.1.1-1: SS-SINR Inter frequency absolute accuracy in FR2

Acc	curacy			Conditions			
Normal	Extreme	SSB	lo <sup>Note 2</sup> range		lo <sup>Note 2</sup> range		je
condition	condition	Ês/lot	Minim	ium lo	Maximum lo		
			dBm / SC	S <sub>SSB</sub> Note 1			
dB	dB	dB	SCS <sub>SSB</sub> = 120kHz	SCS <sub>SSB</sub> = 240kHz	dBm/BW <sub>Channel</sub>		
±3	<u>±</u> 4	≥-3	Same value as SSB_RP in Table B.2.2-2, according to UE Power class, operating band and angle of arrival -50		50		
±3.5	±4	≥-4			-30		
					lauses 7.3.2 and 7.3.4 of		
TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.  Note 2: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.  Note 3: In the test cases, the SSB Ês/lot and related parameters may need to be adjusted to ensure Ês/lot at UE baseband is above the value defined in this table.							
			SB Ês/lot ≤ 25 dB.				

### 10.1.15.1.2 Relative Accuracy of SS-SINR in FR2

The relative accuracy of SS-SINR in inter frequency case is defined as the SS-SINR measured from one cell on a frequency in FR2 compared to the SS-SINR measured from another cell on a different frequency in FR2.

The accuracy requirements in Table 10.1.15.1.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band.
- $|SSB_RP1_{dBm} SSB_RP2_{dBm}| \le 27 dB$

Accuracy

- | Channel 1 Io -Channel 2 Io |  $\leq$  20 dB
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

Table 10.1.15.1.2-1: SS-SINR Inter frequency relative accuracy in FR2

Conditions

Normal	Extreme	SSB	lo Note 2 range				
condition	condition	Ês/lot	Minimum Io		Maximum Io		
			dBm / SC	Sss Note 1			
dB	dB	dB	SCS <sub>SSB</sub> =	SCS <sub>SSB</sub> =	dBm/BW <sub>Channel</sub>		
			120kHz	240kHz			
±3.5	<u>+</u> 4	≥-3	Same value as SSB_RP in Table B.2.2-2, according to UE Power -50				
±4	±4	≥-6	class, operating ba arrival	and and angle of	-50		
	TS 38.101-2 [19	]. Applicable s	ide condition select	ed depending on an			
					RE across the bandwidth.		
			he minimum SSB Ê	s/lot of the pair of ce	ells to which the		
Note 4:	requirement applies.  Note 4: In the test cases, the SSB Ês/lot and related parameters may need to be adjusted to ensure						
	Ês/lot at UE bas	seband is abov	pove the value defined in this table.				
Note 5:	The requiremen	ts apply for SS	SB Ês/lot ≤ 25 dB.				

### 10.1.16 SINR report mapping

### 10.1.16.1 SS-SINR measurement report mapping

The reporting range of SS-SINR is defined from -23 dB to 40 dB with 0.5 dB resolution. The mapping of measured quantity is defined in Table 10.1.16.1-1. The range in the signalling may be larger than the guaranteed accuracy range.

Table 10.1.16.1-1: SS-SINR measurement report mapping

Reported value	Measured quantity value	Unit
SS-SINR_0	SS-SINR<-23	dB
SS-SINR_1	-23≤ SS-SINR<-22.5	dB
SS-SINR_2	-22.5≤ SS-SINR<-22	dB
SS-SINR_3	-22≤ SS-SINR<-21.5	dB
SS-SINR_4	-21.5≤ SS-SINR<-21	dB
SS-SINR_123	38≤ SS-SINR<38.5	dB
SS-SINR_124	38.5≤ SS-SINR<39	dB
SS-SINR_125	39≤ SS-SINR<39.5	dB
SS-SINR_126	39.5≤ SS-SINR<40	dB
SS-SINR_127	40≤ SS-SINR	dB

### 10.1.17 Power Headroom

### 10.1.17.1 Power Headroom Report

#### 10.1.17.1.1 Power Headroom Report Mapping

The power headroom reporting range is from -32 ...+38 dB. Table 10.1.17.1-1 defines the report mapping.

Table 10.1.17.1-1: Power headroom report mapping

Reported value	Measured quantity value (dB)
POWER_HEADROOM_0	PH < -32
POWER_HEADROOM_1	-32 ≤ PH < -31
POWER_HEADROOM_2	-31 ≤ PH < -30
POWER_HEADROOM_3	-30 ≤ PH < -29
POWER_HEADROOM_53	20 ≤ PH < 21
POWER_HEADROOM_54	21 ≤ PH < 22
POWER_HEADROOM_55	22 ≤ PH < 24
POWER_HEADROOM_56	24 ≤ PH < 26
POWER_HEADROOM_57	26 ≤ PH < 28
POWER_HEADROOM_58	28 ≤ PH < 30
POWER_HEADROOM_59	30 ≤ PH < 32
POWER_HEADROOM_60	32 ≤ PH < 34
POWER_HEADROOM_61	34 ≤ PH < 36
POWER_HEADROOM_62	36 ≤ PH < 38
POWER_HEADROOM_63	PH ≥ 38

### 10.1.18 P<sub>CMAX,c,f</sub>

The UE is required to report the UE configured maximum output power  $(P_{CMAX,c,f})$  together with the power headroom. This clause defines the requirements for the  $P_{CMAX,c,f}$  reporting.

#### 10.1.18.1 Report Mapping

The  $P_{CMAX,e,f}$  reporting range is defined from -29 dBm to 33 dBm with 1 dB resolution. Table 10.1.18.1-1 defines the reporting mapping.

Table 10.1.18.1-1 Mapping of PCMAX,c.f

Reported value	Measured quantity value	Unit
PCMAX_C_00	P <sub>CMAX,c,f</sub> < -29	dBm
PCMAX_C_01	-29 ≤ P <sub>CMAX,c,f</sub> < -28	dBm
PCMAX_C_02	-28 ≤ P <sub>CMAX,c,f</sub> < -27	dBm
PCMAX_C_61	$31 \le P_{CMAX,c,f} < 32$	dBm
PCMAX_C_62	$32 \le P_{CMAX,c,f} < 33$	dBm
PCMAX_C_63	33 ≤ P <sub>CMAX,c,f</sub>	dBm

### 10.1.19 L1-RSRP accuracy requirements for FR1

#### 10.1.19.1 SSB based L1-RSRP accuracy requirements

#### 10.1.19.1.1 Absolute Accuracy

Unless otherwise specified, the requirements for absolute accuracy of SSB based L1-RSRP in this clause apply to all SSBs of the serving cell configured for L1-RSRP measurement.

The accuracy requirements in Table 10.1.19.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.4.1 for a corresponding Band for each relevant SSB.

Table 10.1.19.1.1-1: SSB based L1-RSRP absolute accuracy in FR1

Acc	uracy			Condi			
Normal	Extreme	SSB		lo	<sup>Note 1</sup> range		
condition	condition	Ês/lot	NR operating band groups Note 2		Minimum	lo	Maximum lo
		dB		dBm /	SCS <sub>SSB</sub>		
dB	dB			SCS <sub>SSB</sub> = 15 kHz	SCS <sub>SSB</sub> = 30 kHz	dBm/BW <sub>Channel</sub>	dBm/BW <sub>Channel</sub>
			NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	N/A	-70
			NR_FDD_FR1_B	-120.5	-117.5	N/A	-70
		±9.5 ≥-3dB	NR_TDD_FR1_C	-120	-117	N/A	-70
±5.0	±9.5		NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	N/A	-70
			NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	N/A	-70
			NR_FDD_FR1_G	-118	-115	N/A	-70
			NR_FDD_FR1_H	-117.5	-114.5	N/A	-70
±8.5	±11.5	≥-3dB	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A, NR_FDD_FR1_B, NR_TDD_FR1_D, NR_FDD_FR1_D, NR_TDD_FR1_E, NR_TDD_FR1_E, NR_TDD_FR1_E, NR_FDD_FR1_G, NR_FDD_FR1_G, NR_FDD_FR1_H,	N/A	N/A	-70	-50

NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2.

#### 10.1.19.1.2 Relative Accuracy

The relative accuracy of SSB based L1-RSRP is defined as the L1-RSRP measured from one SSB compared to the largest measured value of L1-RSRP among all SSBs of the serving cell.

The accuracy requirements in Table 10.1.19.1.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.4.1 for a corresponding Band for each relevant SSB.

Table 10.1.19.1.2-1: SSB based L1-RSRP relative accuracy in FR1

Accı	ıracy		Conditions							
Normal	Normal Extreme		SB lo Note 1 range							
condition	condition	Ês/lot Note 2	NR operating band groups Note 4		Minimum	lo	Maximum lo			
				dBm /	SCS <sub>SSB</sub>					
dB	dB dB			SCS <sub>SSB</sub> = 15 kHz	SCS <sub>SSB</sub> = 30 kHz	dBm/BW <sub>Channel</sub>	dBm/BW <sub>Channel</sub>			
			NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	N/A	-50			
			NR_FDD_FR1_B	-120.5	-117.5	N/A	-50			
			NR_TDD_FR1_C	-120	-117	N/A	-50			
±3	±4	≥-3dB	NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	N/A	-50			
			NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	N/A	-50			
		[	NR_FDD_FR1_G	-118	-115	N/A	-50			
			NR_FDD_FR1_H	-117.5	-114.5	N/A	-50			

NOTE 2: The parameter SSB Ês/lot is the minimum SSB Ês/lot of the pair of SSBs to which the requirement applies.

NOTE 3: Void

NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2..

### 10.1.19.2 CSI-RS based L1-RSRP accuracy requirements

#### 10.1.19.2.1 Absolute Accuracy

Unless otherwise specified, the requirements for absolute accuracy of CSI-RS based L1-RSRP in this clause apply to all CSI-RS resources of the serving cell configured for L1-RSRP measurement.

The accuracy requirements in Table 10.1.19.2.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.4.2 for a corresponding Band for each relevant CSI-RS.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3.

The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 10.1.19.2.1-1.

Table 10.1.19.2.1-1: CSI-RS based L1-RSRP absolute accuracy in FR1

Accı	ıracy	Conditions						
Normal	Extreme	CSI-		lo <sup>Note 1</sup> range				
condition	condition	RS Ês/lot	NR operating band groups <sup>Note 2</sup>		Mi	nimum lo		Maximum lo
				dB	m / SCScs	SI-RS		
dB	dB	dB		SCS <sub>CSI-</sub> RS = 15 kHz	SCS <sub>CSI-</sub> RS = 30 kHz	SCScsi- RS = 60 kHz	dBm/BW <sub>Channel</sub>	dBm/BW <sub>Channel</sub>
			NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	-115	N/A	-70
			NR_FDD_FR1_B	-120.5	-117.5	-114.5	N/A	-70
			NR_TDD_FR1_C	-120	-117	-114	N/A	-70
±5.0	±9.5	≥-3dB	NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	-113.5	N/A	-70
			NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	-113	N/A	-70
			NR_FDD_FR1_G	-118	-115	-112	N/A	-70
			NR_FDD_FR1_H	-117.5	-114.5	-111.5	N/A	-70
±8.5	±11.5	≥-3dB	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_B, NR_FDD_FR1_C, NR_FDD_FR1_D, NR_TDD_FR1_D, NR_FDD_FR1_E, NR_TDD_FR1_E, NR_TDD_FR1_E, NR_FDD_FR1_G, NR_FDD_FR1_G, NR_FDD_FR1_H	N/A	N/A	N/A	-70	-50

NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2.

#### 10.1.19.2.2 Relative Accuracy

The relative accuracy of CSI-RS based L1-RSRP is defined as the L1-RSRP measured from one CSI-RS compared to the largest measured value of L1-RSRP among all CSI-RS resources of the serving cell.

The accuracy requirements in Table 10.1.19.2.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.4.2 for a corresponding Band for each relevant CSI-RS.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3.

The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 10.1.19.2.2-1.

Table 10.1.19.2.2-1: CSI-RS based L1-RSRP relative accuracy in FR1

Accı	ıracy				Condition				
		CSI-							
Normal condition	Extreme condition	RS Ês/lot Note 2	NR operating band groups <sup>Note 4</sup>		M		Maximum lo		
		dB		dB	m / SCS <sub>CS</sub>	SI-RS			
dB	dB			SCS <sub>CSI-</sub> RS = 15 kHz	RS = 15   RS = 30   RS = 60		dBm/BW <sub>Channel</sub>	dBm/BW <sub>Channel</sub>	
			NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-121	-118	-115	N/A	-50	
			NR_FDD_FR1_B	-120.5	-117.5	-114.5	N/A	-50	
			NR_TDD_FR1_C	-120	-117	-114	N/A	-50	
±3	±4	≥-3dB	NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	-113.5	N/A	-50	
			NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	-113	N/A	-50	
			NR_FDD_FR1_G	-118	-115	-112	N/A	-50	
			NR_FDD_FR1_H	-117.5	-114.5	-111.5	N/A	-50	

NOTE 2: The parameter CSI-RS Ês/lot is the minimum CSI-RS Ês/lot of the pair of CSI-RS resources to which the requirement applies.

NOTE 3: Void

NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.

### 10.1.20 L1-RSRP accuracy requirements for FR2

### 10.1.20.1 SSB based L1-RSRP accuracy requirements

#### 10.1.20.1.1 Absolute Accuracy

Unless otherwise specified, the requirements for absolute accuracy of SSB based L1-RSRP in this clause apply to all SSBs of the serving cell configured for L1-RSRP measurement.

The accuracy requirements in Table 10.1.20.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.4.1 for a corresponding Band for each relevant SSB.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

Table 10.1.20.1.1-1: SSB based L1-RSRP absolute accuracy in FR2

Accı	ıracy		Conditions				
Normal	Extreme	SSB	lo Note 1 range				
condition	condition	Ês/lot		Maximum Io			
			dBm / SC	dBm / SCS <sub>SSB</sub> Note 2			
dB	dB	dB				dBm/BW <sub>Channel</sub>	
			120kHz	240kHz			

±6.5	±9.5	≥-3	Same value as SSB_RP in Table B.2.4.1-2, according to UE Power class, operating band and angle of arrival	N/A	-70
±8.5	+11.5	≥-3	N/A	-70	-50

lo specified at the Reference point, and assumed to have constant EPRE across the bandwidth.

Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of NOTE 2: TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.

NOTE 3: In the test cases, the SSB Es/lot and related parameters may need to be adjusted to ensure Ês/lot at UE baseband is above the value defined in this table.

#### 10.1.20.1.2 Relative Accuracy

The relative accuracy of SSB based L1-RSRP is defined as the L1-RSRP measured from one SSB compared to the largest measured value of L1-RSRP among all SSBs of the serving cell.

The accuracy requirements in Table 10.1.20.1.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.4.1 for a corresponding Band for each relevant SSB.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

Table 10.1.20.1.2-1: SSB based L1-RSRP relative accuracy in FR2

Accuracy			Conditions			
Normal	Extreme	SSB		lo Note 1 range	9	
condition	condition	Ês/lot	Minimum Io		Maximum lo	
			dBm / SCS <sub>SSB</sub> Note 3			
dB	dB	dB	SCS <sub>SSB</sub> = SCS <sub>SSB</sub> =		dBm/BWchannel	
			120kHz	240kHz		
			Same value a	as SSB_RP in		
	±9.5	≥-3	Table B.2.4.1	<ul><li>-2, according</li></ul>		
±6.5			to UE Po	wer class,	-50	
			operating ba	operating band and angle		
			of arrival			
NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE						
across the bandwidth.						
NOTE 2:	Γhe paramete	r SSB Ês/lot	is the minimum	ı SSB Ês/lot of t	he pair of SSBs	
t	o which the re	equirement a	pplies.		•	
NOTE 3: \	OTE 3: Values based on Refsens and EIS enharical coverage as defined in					

NOTE 3: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.

NOTE 4: In the test cases, the SSB Ês/lot and related parameters may need to be adjusted to ensure Ês/lot at UE baseband is above the value defined in this table.

#### 10.1.20.2 CSI-RS based L1-RSRP accuracy requirements

#### 10.1.20.2.1 Absolute Accuracy

Unless otherwise specified, the requirements for absolute accuracy of CSI-RS based L1-RSRP in this clause apply to all CSI-RS resources of the serving cell configured for L1-RSRP measurement.

The accuracy requirements in Table 10.1.20.2.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.

- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.4.2 for a corresponding Band for each relevant CSI-RS.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 10.1.20.2.1-1.

Table 10.1.20.2.1-1: CSI-RS based L1-RSRP absolute accuracy in FR2

Accı	ıracy	Conditions				
Normal	Extreme	CSI-RS		lo <sup>Note 1</sup> range		
condition	condition	Ês/lot		Minimum	lo	Maximum lo
			dBm / SCS <sub>CSI-RS</sub> Note 2			
dB	dB	dB	SCS <sub>CSI-RS</sub> = 60kHz	SCS <sub>CSI-RS</sub> = 120kHz	dBm/BW <sub>Channel</sub>	dBm/BW <sub>Channel</sub>
±6.5	±9.5	≥-3	RS_RP in Tage 2, accord Power class	ue as CSI- able B.2.4.2- ling to UE s, operating agle of arrival	N/A	-70
+8.5	+11.5	≥-3		/A	-70	-50

NOTE 1: lo specified at the Reference point, and assumed to have constant EPRE across the bandwidth.

NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.

NOTE 3: In the test cases, the CSI-RS Ês/lot and related parameters may need to be adjusted to ensure Ês/lot at UE baseband is above the value defined in this table.

#### 10.1.20.2.2 Relative Accuracy

The relative accuracy of CSI-RS based L1-RSRP is defined as the L1-RSRP measured from one CSI-RS compared to the largest measured value of L1-RSRP among all CSI-RS resources of the serving cell.

The accuracy requirements in Table 10.1.20.2.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Conditions for L1-RSRP measurements are fulfilled according to Annex B.2.4.2 for a corresponding Band for each relevant CSI-RS.
- The bandwidth of CSI-RS is 48 PRBs and the density is 3.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

The performance with larger bandwidth of CSI-RS is equal to or better than the accuracy requirements in Table 10.1.20.2.2-1.

Table 10.1.20.2.2-1: CSI-RS based L1-RSRP relative accuracy in FR2

Accı	ıracy	Conditions			
Normal	Extreme	CSI-RS		е	
condition	condition	Ês/lot	Minimum Io		Maximum Io
			dBm / SCS <sub>CSI-RS</sub>		
dB	dB	dB	SCS <sub>CSI-RS</sub> = SCS <sub>CSI-RS</sub> =		dBm/BW <sub>Channel</sub>
			60kHz	120kHz	

±6.5	±9.5	≥-3	Same value as CSI-RS RP in Table B.2.4.2-2, according to UE Power class, operating band and angle of arrival	-50		
NOTE 1:	lo specified at	the Referen	ce point, and assumed to have	constant EPRE		
	across the bandwidth.  NOTE 2: The parameter CSI-RS Ês/lot is the minimum CSI-RS Ês/lot of the pair of					
NOTE 2.			the requirement applies.	lot of the pair of		
NOTE 3:	Values based	on Refsens	and EIS spherical coverage as	defined in		
	clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.					
NOTE 4:	In the test cases, the CSI-RS Ês/lot and related parameters may need to					
			ot at UE baseband is above the			
	this table.					

### 10.1.21 SFTD accuracy requirements

#### 10.1.21.1 SFTD acuracy requirements for NE-DC

The SFN and frame timing difference (SFTD) is measured between PCell and E-UTRAN PSCell under NE-DC.

The accuracy requirements in Table 10.1.21.1-4 are applicable under the following conditions:

For FR1 PCell SFN and frame timing measurement:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Io range deifined in Table 10.1.21.1-1.

Table 10.1.21.1-1: PCell lo range conditions in FR1

	Io Note 1 range					
	NR operating band groups Note 4, 5	Minimun	Maximum lo			
Parameter		dBm/ SCS <sub>SSB</sub>				
		SCS <sub>SSB</sub> = 15 kHz	SCS <sub>SSB</sub> = 30 kHz	dBm/BW <sub>Channel</sub>		
	NR_FDD_FR1_A, NR_TDD_FR1_A	-121	-118	-50		
	NR_FDD_FR1_B	-120.5	-117.5	-50		
	NR_TDD_FR1_C	-120	-117	-50		
Conditions	NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	-50		
	NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	-50		
	NR_FDD_FR1_G	-118	-115	-50		
	NR_FDD_FR1_H	-117.5	-114.5	-50		

- NOTE 1: Io is assumed to have constant EPRE across the bandwidth.
- NOTE 2: The condition level is increased by ΔR<sub>IB,c</sub> as defined in clause 7.3B in TS 38.101-3 [54], depending on E-UTRA NR band combination.
- NOTE 3: The condition level is increased by MSD as defined in clause 7.3B in TS 38.101-3 [54], if applicable depending on E-UTRA NR band combination.
- NOTE 4: NR operating band groups are as defined in clause 3.5.
- NOTE 5: Only NR bands within EN-DC band combinations as specified in clause 5.5B in TS 38.101-3 [54] are applicable.

For FR2 PCell SFN and frame timing measurement:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Io range deifined in Table 10.1.21.1-2.

Table 10.1.21.1-2: PCell lo range conditions in FR2

		Io <sup>Note 1</sup> range	
Doromotor	Minimum	Maximum lo	
Parameter	dBm/ \$	SCS <sub>SSB</sub>	dDm/DW.
	SCS <sub>SSB</sub> = 15 kHz	SCS <sub>SSB</sub> = 30 kHz	dBm/BW <sub>Channel</sub>
Conditions	Same value as SSB_RP in Table B.2.4.1-2, according to UE Power class, operating band and angle of arrival	Same value as SSB_RP in Table B.2.4.1-2, according to UE Power class, operating band and angle of arrival	-50
NOTE 2: Va 2   NOTE 3: In	is assumed to have constant EPRE acro alues based on Refsens and EIS spherica [19]. Applicable side condition selected do the test cases, the SSB Ês/lot and relate seband is above the value defined in this	al coverage as defined in clauses 7.3.2 ar epending on angle of arrival. d parameters may need to be adjusted to	nd 7.3.4 of TS 38.101-

#### For E-UTRA PSCell SFN and frame timing measurement:

- Cell specific reference signals are transmitted either from one, two or four antenna ports.
- Conditions defined in TS 36.101 [25] Clause 7.3 for reference sensitivity are fulfilled.
- No changes to the uplink transmission timing are applied during the measurement period.
- RSRP<sub>dBm</sub> according to Annex B.3.5 in TS 36.101 [25] for a corresponding Band.
- Io range deifined in Table 10.1.21.1-3.

Table 10.1.21.1-3: E-UTRA PSCell lo range conditions

Davamatav	Io <sup>Note 1</sup> range				
Parameter	E-UTRA operating band groups Note 3	Minimum Io	Maximum lo		
		dBm/15kHz Note 2	dBm/BW <sub>Channel</sub>		
	FDD_A, TDD_A	-121	-50		
	FDD_C, TDD_C	-120	-50		
	FDD_D	-119.5	-50		
Conditions	FDD_E, TDD_E	-119	-50		
	FDD_F	-118.5	-50		
	FDD_G	-118	-50		
	FDD_H	-117.5	-50		
	FDD_N	-114.5	-50		

NOTE 1: When in dBm/15kHz, the minimum lo condition is expressed as the average lo per RE over all REs in that symbol. Io may be different in different symbols within a subframe.

NOTE 2: The condition level is increased by ∆>0, when applicable, as described in clauses B.4.2 and B.4.3 in TS36.133 [15].

NOTE 3: E-UTRA operating band groups are as defined in clause 3.5 in TS 36.133 [15].

Table 10.1.21.1-4: SFTD measurement accuracy

	Conditions		
Accuracy	Ês/lot Note 2	Frequency range	
Ts Note 1	dB		
40*64*Tc	> 0 AD	FR1	
40*64*Tc	≥-3 dB	FR2	
NOTE 1: To is the basic timing unit defined in TS 38.211 [6].			

NOTE 2: The parameter Ês/lot is the minimum Ês/lot of the pair of cells to which the requirement applies.

### 10.1.21.2 SFTD acuracy requirements for NR-DC

The SFN and frame timing difference (SFTD) is measured between PCell in FR1 and PSCell in FR2 under NR dual connectivity.

The accuracy requirements in Table 10.1.21.2-3 are applicable under the following conditions:

For FR1 PCell SFN and frame timing measurement:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Io range deifined in Table 10.1.21.2-1.

Table 10.1.21.2-1: PCell lo range conditions in FR1

	lo	Note 1 range		
	NR operating band groups Note 2	Minim	Maximum lo	
Parameter	·	dBm/ SCS <sub>SSB</sub>		
		SCS <sub>SSB</sub> = 15	SCS <sub>SSB</sub> = 30	dBm/BW <sub>Channel</sub>
		kHz	kHz	
	NR_FDD_FR1_A, NR_TDD_FR1_A	-121	-118	-50
	NR_FDD_FR1_B	-120.5	-117.5	-50
	NR_TDD_FR1_C	-120	-117	-50
Conditions	NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	-50
	NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	-50
	NR_FDD_FR1_G	-118	-115	-50
	NR_FDD_FR1_H	-117.5	-114.5	-50

NOTE 1: lo is assumed to have constant EPRE across the bandwidth.

NOTE 2: NR operating band groups are as defined in clause 3.5.2.

For FR2 PSCell SFN and frame timing measurement:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Io range deifined in Table 10.1.21.2-2.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

Table 10.1.21.2-2: PSCell lo range conditions in FR2

Parameter	Minimum	1 lo <sup>Note 2, 3</sup>	Maximum lo
Parameter	dBm/ SCS <sub>SSB</sub>		dBm/BWchannel
	SCS <sub>SSB</sub> = 15 kHz	SCS <sub>SSB</sub> = 30 kHz	QBIII/BVVChannel
Conditions	Same value as SSB_RP in Table B.2.4.1-2, according to UE Power class, operating band and angle of arrival	Same value as SSB_RP in Table B.2.4.1-2, according to UE Power class, operating band and angle of arrival	-50

NOTE 1: Io is assumed to have constant EPRE across the bandwidth and specified at the Reference point.

NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.

NOTE 3: In the test cases, the SSB £s/lot and related parameters may need to be adjusted to ensure £s/lot at UE baseband is above the value defined in this table.

Table 10.1.21.2-3: SFTD measurement accuracy

	Conditions		
Accuracy	Ês/lot Note 2	Frequency range	
Ts Note 1	dB		
40*64*Tc	≥ -3 dB	Between FR1 and FR2	
NOTE 1: Tc is the basic timir			
NOTE 2: The parameter Ês/I		of the pair of cells to which the	
requirement applies	S.		

### 10.1.21.3 Inter frequency SFTD acuracy requirements

The SFN and frame timing difference (SFTD) is measured between PCell and inter-frequency neighbour cell.

The accuracy requirements in Table 10.1.21.3-3 are applicable under the following conditions:

For FR1 PCell, inter frequency neighbour cell SFN and frame timing measurement:

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
- Io range deifined in Table 10.1.21.3-1.

Table 10.1.21.3-1: PCell, inter frequency neighbour cell lo range conditions in FR1

	lo <sup>Note 1</sup> range						
Ī	NR operating band groups Note 2	Minim	Maximum lo				
Parameter	•	dBm/	SCS <sub>SSB</sub>				
		SCS <sub>SSB</sub> = 15 kHz	SCS <sub>SSB</sub> = 30 kHz	dBm/BW <sub>Channel</sub>			
	NR_FDD_FR1_A, NR_TDD_FR1_A	-121	-118	-50			
	NR_FDD_FR1_B	-120.5	-117.5	-50			
	NR_TDD_FR1_C	-120	-117	-50			
Conditions	NR_FDD_FR1_D, NR_TDD_FR1_D	-119.5	-116.5	-50			
	NR_FDD_FR1_E, NR_TDD_FR1_E	-119	-116	-50			
	NR_FDD_FR1_G	-118	-115	-50			
	NR FDD FR1 H	-117.5	-114.5	-50			

For FR2 PCell, inter frequency neighbour cell SFN and frame timing measurement:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
- Io range deifined in Table 10.1.21.3-2.
- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

Table 10.1.21.3-2: PCell, inter frequency neighbour cell lo range conditions in FR2

		lo <sup>Note 1</sup> range	
Parameter	Minimum	Maximum Io	
Parameter	dBm/ S	SCS <sub>SSB</sub>	dBm/BWchannel
	SCS <sub>SSB</sub> = 15 kHz	SCS <sub>SSB</sub> = 30 kHz	GBIII/BVVCnannei
Conditions	Same value as SSB_RP in Table B.2.4.1-2, according to UE Power class, operating band and angle of arrival	Same value as SSB_RP in Table B.2.4.1-2, according to UE Power class, operating band and angle of arrival	-50
NOTE 2: Va 2   NOTE 3: In	alues based on Refsens and EIS spherica [19]. Applicable side condition selected de	d parameters may need to be adjusted to	nd 7.3.4 of TS 38.101-

Table 10.1.21.3-3: Inter frequency SFTD measurement accuracy

	Conditions					
Accuracy	Ês/lot Note 2	Frequency range				
Ts Note 1	dB					
40*64*Tc	≥ -3 dB	FR1, FR2				
NOTE 1: Tc is the basic timir	ng unit defined in TS 38.2	11 [6].				
NOTE 2: The parameter £s/lot is the minimum £s/lot of the pair of cells to which the requirement applies.						

### 10.2 E-UTRAN measurements

#### 10.2.1 Introduction

Accuracy requirements for measurements on E-UTRAN carrier frequencies are specified in clause 10.2 and apply for UE in SA or NR-DC operation mode.

The requirements in clause 10.2 are applicable for a UE:

- in RRC\_CONNECTED state
- performing measurements with appropriate measurement gaps according to clause 9.1.2.
- that is synchronised to the cell that is measured.

The reported measurement result after layer 1 filtering shall be an estimate of the average value of the measured quantity over the measurement period. The reference point for the measurement result after layer 1 filtering is referred to as point B in the measurement model described in TS 36.300 [24].

The accuracy requirements of E-UTRA measurements in this clause are valid for the reported measurement result after layer 1 filtering. The accuracy requirements are verified from the measurement report at point D in the measurement model having the layer 3 filtering disabled.

If the UE needs measurement gaps to perform the inter-RAT NR — E-UTRAN FDD and NR — E-UTRAN TDD measurements, the relevant measurement procedure and measurement gap patterns stated in clause 9.1.2 shall apply.

#### 10.2.2 E-UTRAN RSRP measurements

NOTE: This measurement is for handover between NR and E-UTRAN.

The measurement period of E-UTRA RSRP in RRC CONNECTED state is specified in clause 9.4.2 and 9.4.3.

The accuracy requirements of E-UTRA RSRP measurements in RRC\_CONNECTED state and the corresponding side conditions shall be the same as the inter-frequency RSRP Accuracy Requirements in clause 9.1.3 of TS 36.133 [15].

The reporting range and mapping specified for RSRP measurements in clause 9.1.4 of TS 36.133 [15] shall apply.

#### 10.2.3 E-UTRAN RSRQ measurements

NOTE: This measurement is for handover between NR and E-UTRAN.

The measurement period of E-UTRA RSRQ in RRC CONNECTED state is specified in clause 9.4.2 and 9.4.3.

The accuracy requirements of E-UTRA RSRQ measurements in RRC\_CONNECTED state and the corresponding side conditions shall be the same as the inter-frequency RSRQ Accuracy Requirements in clause 9.1.6 of TS 36.133 [15].

The requirements for accuracy of E-UTRA RSRQ measurements in RRC\_CONNECTED state and the corresponding side conditions shall be the same as the inter-frequency RSRQ Accuracy Requirements in clause 9.1.6 of TS 36.133 [15].

The reporting range and mapping specified for RSRQ measurements in clause 9.1.7 of TS 36.133 [15] shall apply.

### 10.2.4 E-UTRAN RSTD measurements

The requirements in this clause are valid for UE supporting this capability.

The measurement period is specified in clauses 9.4.4.1 and 9.4.4.2 for inter-RAT NR — E-UTRAN FDD and inter-RAT NR — E-UTRAN TDD RSTD measurements, respectively.

The accuracy requirements and the corresponding side conditions shall be the same as the inter-frequency measurement accuracy requirements for RSTD measurements in RRC CONNECTED in clause 9.1.10.2 of TS 36.133 [15].

If the UE needs measurement gaps to perform the inter-RAT NR — E-UTRAN FDD and NR — E-UTRAN TDD RSTD measurements, the relevant measurement procedure and measurement gap patterns stated in clause 9.1.2 shall apply.

The reporting range and mapping for the inter-RAT NR — E-UTRAN FDD and NR — E-UTRAN TDD RSTD measurements is the same as specified for RSTD measurements in TS 36.133 [15, clauses 9.1.10.3 and 9.1.10.4].

### 10.2.5 E-UTRAN RS-SINR measurements

NOTE: This measurement is for handover between NR and E-UTRAN.

The measurement period of E-UTRA RS-SINR in RRC\_CONNECTED state is specified in clause 9.4.2 and 9.4.3.

The accuracy requirements of E-UTRA RS-SINR measurements in RRC\_CONNECTED state and the corresponding side conditions shall be the same as the inter-frequency RS-SINR Accuracy Requirements in clause 9.1.17.3 of TS 36.133 [15].

The reporting range and mapping for E-UTRA RS-SINR measurements shall be the same as specified for RS-SINR measurements in clause 9.1.17.1 of TS 36.133 [15].

### 11 Void

# Annex A (normative): Test Cases

### A.1 Purpose of annex

### A.2 Requirement classification for statistical testing

Requirements in this specification are either expressed as absolute requirements with a single value stating the requirement, or expressed as a success rate. There are no provisions for the statistical variations that will occur when the parameter is tested.

Annex A outlines the tests in more detail and lists the test parameters needed. The test will result in an outcome of a test variable value for the device under test (DUT) inside or outside the test limit. Overall, the probability of a "good" DUT being inside the test limit(s) and the probability of a "bad" DUT being outside the test limit(s) should be as high as possible. For this reason, when selecting the test variable and the test limit(s), the statistical nature of the test is accounted for.

The statistical nature depends on the type of requirement. Some have large statistical variations, while others are not statistical in nature at all. When testing a parameter with a statistical nature, a confidence level is set. This establishes the probability that a DUT passing the test actually meets the requirements and determines how many times a test has to be repeated and what the pass and fail criteria are. Those aspects are not covered by TS 38.133. The details of the tests on how many times to run it and how to establish confidence in the tests are described in TS 38.533 [5]. This Annex establishes the variable to be used in the test and whether it can be viewed as statistical in nature or not.

### A.2.1 Types of requirements in TS 38.133

### A.2.1.1 Time and delay requirements on UE higher layer actions

A very large part of the RRM requirements are delay requirements:

- In RRC IDLE state mobility (clause A.4.x, A.5.x, A.6.x and A.7.x) there is cell re-selection delay.
- In RRC\_CONNECTED state mobility (clauses A.4.3, A.4.6, A.5.3, A.5.6, A.6.3, A.6.6, A.7.3 and A.7.6) there is handover delay, cell search delay and measurement reporting delay.
- In RRC Connection Control (clauses A.4.3.2, A.5.3.2, A.6.3.2 and A.7.3.2) there is RRC re-establishment delay.

All have in common that the UE is required to perform an action observable in higher layers (e.g. camp on the correct cell) within a certain time after a specific event (e.g. when a new strong pilot or reference signal appears). The delay time is statistical in nature for several reasons, among others that several of the measurements are performed by the UE in a fading radio environment.

The variations make a strict limit unsuitable for a test. Instead there is a condition set for a correct action by the UE, e.g. that the UE shall camp on the correct cell within X seconds. Then the rate of correct events is observed during repeated tests and a limit is set on the rate of correct events, usually 90% correct events are required. How the limit is applied in the test depends on the confidence required, further detailed are in TS 38.533 [5].

### A.2.1.2 Measurements of power levels, relative powers and time

A very large number of requirements are on measurements that the UE performs:

- In RRC\_CONNECTED state mobility (clauses A.4.3, A.5.3, A.6.3 and A.7.3) there are measurement reports.
- In Measurement Performance Requirements (clauses A.4.7, A.5.7, A.6.7 and A.7.7) there are requirements for all type of measurements.

The accuracy requirements on measurements are expressed in this specification as a fixed limit (e.g.  $\pm$ /-X dB), but the measurement error will have a distribution that is not easily confined in fixed limits. Assuming a Gaussian distribution of the error, the limits will have to be set at  $\pm$ /-3.29 $\sigma$  if the probability of failing a "good DUT" in a single test is to be kept at 0.1%. It is more reasonable to set the limit tighter and test the DUT by counting the rate of measurements that are within the limits, in a way similar to the requirements on delay.

### A.2.1.3 Implementation requirements

A few requirements are strict actions the UE should take or capabilities the UE should have, without any allowance for deviations. These requirements are absolute and should be tested as such. Examples are:

- "Event triggered report rate" in RRC\_CONNECTED state mobility (clauses A.4.3, A.4.6, A.5.3, A.5.6, A.6.3, A.6.6, A.7.3 and A.7.6)
- "Correct behaviour at time-out" in RRC connection control (clauses A.4.3.2, A.5.3.2, A.6.3.2 and A.7.3.2)

### A.2.1.4 Physical layer timing requirements

There are requirements on Timing (clauses A.4.4, A.5.4, A.6.4 and A.7.4). There are both absolute and relative limits on timing accuracy depending upon the type of requirement. Examples are:

- Initial Transmit Timing (clauses A.4.4.1, A.5.4.1, A.6.4.1 and A.7.4.1) has an absolute limit on timing accuracy.
- Timing Advance (clauses A.4.4.2, A.5.4.2, A.6.4.2 and A.7.4.2) has a relative limit on timing accuracy.

### A.3 RRM test configurations

### A.3.1 Reference measurement channels

#### A.3.1.1 PDSCH

#### A.3.1.1.1 FDD

Table A.3.1.1.1: PDSCH Reference Measurement Channels for SCS=15kHz

Parameter	Unit	Value					
Reference channel		SR.1.1 FDD					
Channel bandwidth	MHz	10					
Number of transmitter antennas		1					
Allocated resource blocks for PDSCH Note 1		24					
Allocated slots per Radio Frame		10					
Radio frame containing SSB	slots	Note 5					
Radio frame not containing SSB	slots	10					
MCS index		4					
Modulation		QPSK					
Target Coding Rate		1/3					
Number of control symbols		2					
PDSCH mapping type		Type A					
Information Bit Payload							
For slots with RMSI Note 2	bits	1864					
Number of Code Blocks per slot		1					
Binary Channel Bits Per slot							
For slots with RMSI Note 2, Note 4	bits	6048					_

Note 1: Allocated outside the SMTC duration in time and in resource blocks which do not overlap with the resource blocks allocated for SS/PBCH block.

Note 5: PDSCH is not scheduled in slots containing SSB according to the SSB configuration used in the test. SSB configurations are defined in clause A.3.10.

Note 2: PDSCH is scheduled on the slots with RMSI.

Note 3: If necessary the information bit payload size can be adjusted to facilitate the test implementation. The payload sizes are defined in TS 38.213 [3].

Note 4: Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditonalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s) without data: 1.

### A.3.1.1.2 TDD

Table A.3.1.1.2-1: PDSCH Reference Measurement Channels for SCS=15kHz

Parameter	Unit		Value
Reference channel		SR.1.1 TDD	
Channel bandwidth	MHz	10	
Number of transmitter antennas		1	
Allocated resource blocks for PDSCH Note 1		24	
Allocated slots per Radio Frame			
Radio frame containing SSB	slots	Note 5	
Radio frame not containing SSB	slots	4	
MCS table		64QAM	
MCS index		4	
Modulation		QPSK	
Target Coding Rate		1/3	
Number of control symbols		2	
PDSCH mapping type		Type A	
Information Bit Payload			
For slots with RMSI Note 2	bits	1864	
Number of Code Blocks per slot		1	
Binary Channel Bits Per slot			
For slots with RMSI Note 2, Note 4	bits	6048	

Note 1: Allocated outside the SMTC duration in time and in resource blocks which do not overlap with the resource blocks allocated for SS/PBCH block.

Note 2: PDSCH is scheduled on the slots with RMSI.

Note 3: If necessary the information bit payload size can be adjusted to facilitate the test implementation. The payload sizes are defined in TS 38.213 [3].

Note 4: Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditonalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s) without data: 1.

Note 5: PDSCH is not scheduled in slots containing SSB according to the SSB configuration used in the test. SSB configurations are defined in clause A.3.10.

Table A.3.1.1.1-2: PDSCH Reference Measurement Channels for SCS=30kHz

Parameter	Unit		Value
Reference channel		SR.2.1 TDD	
Channel bandwidth	MHz	40	
Number of transmitter antennas		1	
Allocated resource blocks for PDSCH Note 1		24	
Allocated slots per Radio Frame			
Radio frame containing SSB	slots	Note 5	
Radio frame not containing SSB	slots	10	
MCS table		64QAM	
MCS index		4	
Modulation		QPSK	
Target Coding Rate		1/3	
Number of control symbols		2	
PDSCH mapping type		Type A	
Information Bit Payload			
For slots with RMSI Note 2	bits	1864	
Number of Code Blocks per slot		1	
Binary Channel Bits Per slot			
For slots with RMSI Note 2, Note 4	bits	6048	

- Note 1: Allocated outside the SMTC duration in time and in resource blocks which do not overlap with the resource blocks allocated for SS/PBCH block.
- Note 2: PDSCH is scheduled on the slots with RMSI.
- Note 3: If necessary the information bit payload size can be adjusted to facilitate the test implementation. The payload sizes are defined in TS 38.213 [3].
- Note 4: Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditonalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s) without data: 1.
- Note 5: PDSCH is not scheduled in slots containing SSB according to the SSB configuration used in the test. SSB configurations are defined in clause A.3.10.

Table A.3.1.1.1-3: PDSCH Reference Measurement Channels for SCS=120kHz

Parameter	Unit	Value				
Reference channel		SR.3.1 TDD				
Channel bandwidth	MHz	100				
Number of transmitter antennas		1				
Allocated resource blocks for PDSCH Note 1		24				
Allocated slots per Radio Frame						
Radio frame containing SSB	slots	Note 5				
Radio frame not containing SSB	slots	48				
MCS table		64QAM				
MCS index		4				
Modulation		QPSK				
Target Coding Rate		1/3				
Number of control symbols		2				
PDSCH mapping type		Type A				
Information Bit Payload						
For slots with RMSI Note 2	bits	1864				
Number of Code Blocks per slot		1				
Binary Channel Bits Per slot						
For slots with RMSI Note 2, Note 4	bits	6048				

- Note 1: Allocated outside the SMTC duration in time and in resource blocks which do not overlap with the resource blocks allocated for SS/PBCH block
- Note 2: PDSCH is scheduled on the slots with RMSI.
- Note 3: If necessary the information bit payload size can be adjusted to facilitate the test implementation. The payload sizes are defined in TS 38.213 [3].
- Note 4: Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditonalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s) without data: 1.
- Note 5: PDSCH is not scheduled in slots containing SSB according to the SSB configuration used in the test. SSB configurations are defined in clause A.3.10.

### A.3.1.2 CORESET for RMSI scheduling

#### A.3.1.2.1 FDD

Table A.3.1.2.1-1: RMSI CORESET Reference Channel for FDD with SCS=15KHz

Parameter	Unit		Value
Reference channel		CR.1.1 FDD	
Channel bandwidth	MHz	10	
Subcarrier spacing for RMSI CORESET	kHz	15	
Allocated resource blocks for RMSI CORESET Note 7		24	
Subcarrier spacing for SSB	kHz	15	
SSB and RMSI CORESET multiplexing configuration Note 7		Pattern 1	
Offset between SSB and RMSI CORESET Note 3, 7	RB	0 (Note8)	
Configuration of PDCCH monitoring occasions for RMSI CORESET Note 4		Index 4	
Number of transmitter antennas		1	
Duration of RMSI CORESET Note 7	symbols	2	
DCI Format Note 1		Note 2	
Aggregation level	CCE	8	
DMRS precoder granularity		6	
REG bundle size		6	
Mapping from REG to CCE		Distributed	
Cell ID		Note 5	
Payload (without CRC)	bits	Note 6	

- Note 1: DCI formats are defined in TS 38.212.
- Note 2: DCI format shall depend upon the test configuration.
- Note 3: The offset is defined with respect to the subcarrier spacing of the CORESET from the smallest RB index of RMSI CORESET to the smallest RB index of the common RB overlapping with the first RB of the SS/PBCH block.
- Note 4: The configuration of PDCCH monitoring occasions for RMSI CORESET is defined in Table 13-11 in TS 38.213 [3].
- Note 5: Cell ID shall depend upon the test configuration.
- Note 6: Payload size shall depend upon the test configuration.
- Note 7: The configuration of set of resource blocks and slot symbols of control resource set for Type0-PDCCH search space corresponds to index 0 in Table 13-1 in TS 38.213 [3]
- Note 8: Other values can be used to align with GSCN [13] as long as SSB does not overlap the RMC.

#### A.3.1.2.2 TDD

Table A.3.1.2.2-1: RMSI CORESET Reference Channel for TDD with SCS=15KHz

Parameter	Unit		Value
Reference channel		CR.1.1 TDD	
Channel bandwidth	MHz	10	
Subcarrier spacing	kHz	15	
Allocated resource blocks for RMSI CORESET Note 7		24	
SSB and RMSI CORESET multiplexing configuration Note 7		Pattern 1	
Offset between SSB and RMSI CORESET Note 3, 7	RB	0 (Note 8)	
Configuration of PDCCH monitoring occasions for RMSI CORESET Note 4		Index 4	
Number of transmitter antennas		1	
Duration of RMSI CORESET Note 7	symbols	2	
DCI Format Note 1		Note 2	
Aggregation level	CCE	8	
DMRS precoder granularity		6	
REG bundle size		6	
Mapping from REG to CCE		Distributed	
Cell ID		Note 5	
Payload (without CRC)	bits	Note 6	

- Note 1: DCI formats are defined in TS 38.212.
- Note 2: DCI format shall depend upon the test configuration.
- Note 3: The offset is defined with respect to the subcarrier spacing of the CORESET from the smallest RB index of RMSI CORESET to the smallest RB index of the common RB overlapping with the first RB of the SS/PBCH block.
- Note 4: The configuration of PDCCH monitoring occasions for RMSI CORESET is defined in Table 13-11 in TS 38.213 [3].
- Note 5: Cell ID shall depend upon the test configuration.
- Note 6: Payload size shall depend upon the test configuration.
- Note 7: The configuration of set of resource blocks and slot symbols of control resource set for Type0-PDCCH search space corresponds to index 0 in Table 13-1 in TS 38.213 [3].
- Note 8: Other values can be used to align with GSCN [13] as long as SSB does not overlap the RMC.

Table A.3.1.2.2-2: RMSI CORESET Reference Channel for TDD with SCS=30KHz

Parameter	Unit			Value		
Reference channel		CR.2.1				
		TDD				
Channel bandwidth	MHz	40				
Subcarrier spacing	kHz	30				
Allocated resource blocks for RMSI CORESET Note 7		24				
SSB and RMSI CORESET multiplexing configuration Note 7		Pattern 1				
Offset between SSB and RMSI CORESET Note 3, 7	RB	0 (Note 8)				
Configuration of PDCCH monitoring occasions for RMSI CORESET Note 4		Index 4				
Number of transmitter antennas		1				
Duration of RMSI CORESET Note 7	symbols	2				
DCI Format Note 1		Note 2				
Aggregation level	CCE	8				
DMRS precoder granularity		6				
REG bundle size		6				
Mapping from REG to CCE		Distributed				
Cell ID		Note 5				
Payload (without CRC)	bits	Note 6			_	

- Note 1: DCI formats are defined in TS 38.212.
- Note 2: DCI format shall depend upon the test configuration.
- Note 3: The offset is defined with respect to the subcarrier spacing of the CORESET from the smallest RB index of RMSI CORESET to the smallest RB index of the common RB overlapping with the first RB of the SS/PBCH block.
- Note 4: The configuration of PDCCH monitoring occasions for RMSI CORESET is defined in Table 13-11 in TS 38.213 [3].
- Note 5: Cell ID shall depend upon the test configuration.
- Note 6: Payload size shall depend upon the test configuration.
- Note 7: The configuration of set of resource blocks and slot symbols of control resource set for Type0-PDCCH search space corresponds to index 0 in Table 13-6 in TS 38.213 [3].
- Note 8: Other values can be used to align with GSCN [13] as long as SSB does not overlap the RMC.

Table A.3.1.2.2-3: RMSI CORESET Reference Channel for TDD with SCS=120KHz

Parameter	Unit		Value
Reference channel		CR.3.1 TDD	
Channel bandwidth	MHz	100	
Subcarrier spacing	kHz	120	
Allocated resource blocks for RMSI CORESET Note 7		24	
SSB and RMSI CORESET multiplexing configuration Note 7		Pattern 1	
Offset between SSB and RMSI CORESET Note 3, 7	RB	0 (Note 8)	
Configuration of PDCCH monitoring occasions for RMSI CORESET Note 4		Index 4	
Number of transmitter antennas		1	
Duration of RMSI CORESET Note 7	symbols	2	
DCI Format Note 1		Note 2	
Aggregation level	CCE	8	
DMRS precoder granularity		6	
REG bundle size		6	
Mapping from REG to CCE		Distributed	
Cell ID		Note 5	
Payload (without CRC)	bits	Note 6	

- Note 1: DCI formats are defined in TS 38.212.
- Note 2: DCI format shall depend upon the test configuration.
- Note 3: The offset is defined with respect to the subcarrier spacing of the CORESET from the smallest RB index of RMSI CORESET to the smallest RB index of the common RB overlapping with the first RB of the SS/PBCH block.
- Note 4: The configuration of PDCCH monitoring occasions for RMSI CORESET is defined in Table 13-12 in TS 38.213 [3].
- Note 5: Cell ID shall depend upon the test configuration.
- Note 6: Payload size shall depend upon the test configuration.
- Note 7: The configuration of set of resource blocks and slot symbols of control resource set for Type0-PDCCH search space corresponds to index 0 in Table 13-8 in TS 38.213 [3].
- Note 8: Other values can be used to align with GSCN [13] as long as SSB does not overlap the RMC.

### A.3.1.3 CORESET for RMC scheduling

#### A.3.1.3.1 FDD

Table A.3.1.3.1-1: Control Channel RMC for FDD with SCS=15KHz

Parameter	Unit	Value						
Reference channel		CCR.1.1 FDD						
Channel bandwidth	MHz	10						
Subcarrier spacing	kHz	15						
Allocated resource blocks for CORESET Note 3		24						
Number of transmitter antennas		1						
Duration of CORESET	symbols	2						
REG bundle size		6						
DMRS precoder granularity		Same as REG bundle size						
CCE to REG mapping		Interleaved						
Interleave n_shift		0						
Interleave size		2						
Beamforming Pre-Coder		N/A						
Aggregation level	CCE	8						
DCI formats		Note 1						
Payload size (without CRC)	bits	Note 2						

Note 1: DCI format shall depend upon the test configuration.

Note 2: Payload size shall depend upon the test configuration

Note 3: Allocated in the same resource blocks where the associated RMC is scheduled.

#### A.3.1.3.2 TDD

Table A.3.1.3.2-1: Control Channel RMC for TDD with SCS=15KHz

Parameter	Unit	Value					
Reference channel		CCR.1.1 TDD					
Channel bandwidth	MHz	10					
Subcarrier spacing	kHz	15					
Allocated resource blocks for CORESET Note 3		24					
Number of transmitter antennas		1					
Duration of CORESET	symbols	2					
REG bundle size		6					
DMRS precoder granularity		Same as REG bundle size					
CCE to REG mapping		Interleaved					
Interleave n_shift		0					
Interleave size		2					
Beamforming Pre-Coder		N/A					
Aggregation level	CCE	8					
DCI formats		Note 1					
Payload size (without CRC)	bits	Note 2					

Note 1: DCI format shall depend upon the test configuration.

Note 2: Payload size shall depend upon the test configuration

Note 3: Allocated in the same resource blocks where the associated RMC is scheduled.

Table A.3.1.3.2-2: Control Channel RMC for TDD with SCS=30KHz

Parameter	Unit			Value		
Reference channel		CCR.2.1 TDD				
Channel bandwidth	MHz	40				
Subcarrier spacing	kHz	30				
Allocated resource blocks for CORESET Note 3		24				
Number of transmitter antennas		1				
Duration of CORESET	symbols	2				
REG bundle size		6				
DMRS precoder granularity		Same as REG bundle size				
CCE to REG mapping		Interleaved				
Interleave n_shift		0				
Interleave size		2				
Beamforming Pre-Coder		N/A				
Aggregation level	CCE	8				
DCI formats		Note 1				
Payload size (without CRC)	bits	Note 2				

Note 1: DCI format shall depend upon the test configuration.

Note 2: Payload size shall depend upon the test configuration.

Note 3: Allocated in the same resource blocks where the associated RMC is scheduled.

Table A.3.1.3.2-3: Control Channel RMC for TDD with SCS=120KHz

Parameter	Unit			Value		
Reference channel		CCR.3.1	CCR.3.2	CCR.3.3		
		TDD	TDD	TDD		
Channel bandwidth	MHz	100	100	100		
Subcarrier spacing	kHz	120	120	120		
Allocated resource blocks for CORESET Note 3		24	24	24		
Number of transmitter antennas		1	1	1		
monitoringSlotPeriodicityAndOffset		sl160	sl160	sl160		
		0	0	80		
monitoringSymbolsWithinSlot		1100000 0000000	0011000 0000000	1100000 0000000		
Duration of CORESET	slot	1	1	1		
REG bundle size		6	6	6		
		Same as	Same as	Same as		
DMRS precoder granularity		REG	REG	REG		
Divires precoder grandianty		bundle	bundle	bundle		
		size	size	size		
CCE to REG mapping		Interleaved	Interleaved	Interleaved		
Interleave n_shift		0	0	0		
Interleave size		2	2	2		
Beamforming Pre-Coder		N/A	N/A	N/A		
Aggregation level	CCE	8	8	8		
DCI formats		Note 1	Note 1	Note 1		
Payload size (without CRC)	bits	Note 2	Note 2	Note 2		

Note 1: DCI format shall depend upon the test configuration.

Note 2: Payload size shall depend upon the test configuration.

Allocated in the same resource blocks where the associated PDSCH RMC is scheduled. Note 3:

### A.3.1.4 TDD UL/DL configuration

Table A.3.1.4-1: TDD UL/DL configuration for SCS=15kHz

Unit		Value	
	TDDConf.1.1		
kHz	15		
	'DSUU'		
	S='10DL:2GP:2UL'		
ms	4		
	1		
	10		
	2		
	2		
	'D'		
ms	1		
	1		
	0		
	0		
	0		
	kHz	TDDConf.1.1  kHz 15	TDDConf.1.1  kHz 15  'DSUU' S='10DL:2GP:2UL'  ms 4  1 10 2 2 2 'D' ms 1  1 0 0 0

As specified in TS 38.213 [3] and TS 38.331 [2].

Note 2: For information

Table A.3.1.4-2: TDD UL/DL configuration for SCS=30kHz

Unit		Value
	TDDConf.2.1	
kHz	30	
	'3D1S4U' S='6DL:4GP:4UL'	
ms	4	
	3	
	6	
	4	
	4	
	'DD'	
ms	1	
	2	
	0	
	0	
	0	
	kHz ms	TDDConf.2.1  kHz 30  '3D1S4U' S='6DL:4GP:4UL'  ms 4  3 6 4 4 4 'DD' ms 1  2 0 0

Note 1: As specified in TS 38.213 [3] and TS 38.331 [2].

Note 2: For information

Table A.3.1.4-3: TDD UL/DL configuration for SCS=120kHz

Parameter	Unit		Value
Reference channel		TDDConf.3.1	
referenceSubcarrierSpacing	kHz	120	
TDD UL/DL pattern 1 Note 2		'DDDSU'	
		S='10DL:2GP:2UL'	
dI-UL-	ms	0.625	
TransmissionPeriodicity			
nrofDownlinkSlots		3	
nrofDownlinkSymbols		10	
nrofUplinkSlot		1	
nrofUplinkSymbols		2	
TDD UL/DL pattern 2 Note 2		Not configured	
dI-UL-	ms	Not configured	
TransmissionPeriodicity			
nrofDownlinkSlots		Not configured	
nrofDownlinkSymbols		Not configured	
nrofUplinkSlot		Not configured	
nrofUplinkSymbols		Not configured	

Note 1: As specified in TS 38.213 [3] and TS 38.331 [2].

Note 2: For information

### A.3.2 OFDMA channel noise generator (OCNG)

### A.3.2.1 Generic OFDMA Channel Noise Generator (OCNG)

The OCNG pattern is used in a test for modelling allocations of unused resources in the channel bandwidth to virtual UEs (which are not under test). The OCNG pattern comprises PDCCH and PDSCH transmissions to the virtual UEs.

### A.3.2.1.1 OCNG pattern 1: Generic OCNG pattern for all unused REs

Table A.3.2.1.1-1: OP.1: Generic OCNG pattern for all unused REs

OCNG Parameters	Control Region	Data Region		
Resource allocation	Unused REs (Note 1)	Unused REs (Note 2)		
Channel	PDCCH	PDSCH		
Contents	Virtual UE IDs	Uncorrelated pseudo random QPSK modulated data		
Antenna transmission scheme	Same as used in PDCCH RMC	Same as used in PDSCH RMC		
Subcarrier spacing	Same as used in PDCCH RMC	Same as used in PDSCH RMC		
Aggregation level	Same as used in PDCCH RMC	N/A		
Code rate	Same as used in PDCCH RMC	Same as used in PDSCH RMC		
Transmit Power	Same as used in PDCCH RMC	Same as used in PDSCH RMC		
CP length	Same as used in PDCCH RMC	Same as used in PDSCH RMC		
Note 1: REs not used in the active CORESETs where PDCCH is scheduled for the UE under test.				
	REs not allocated to any physical channels, CORESET, SSB or any other reference signal within the channel bandwidth of the cell.			

## A.3.2.1.2 OCNG pattern 2: Generic OCNG pattern for all unused REs for 2AoA setup

Table A.3.2.1.2-2: OP.2: Generic OCNG pattern for all unused REs for 2AoA setup

OCNG Parameters	Control Region	Data Region
Probe	Transmitting the serving beam	
Resource allocation	Unused REs (Note 1) in the symbols where SSB/CSI-RS are not transmitted from both the serving beam probe and non-serving beam probe.	Unused REs (Note 2) in the symbols where SSB/CSI-RS are not transmitted from both the serving beam probe and non-serving beam probe.
Channel	PDCCH	PDSCH
Contents	Virtual UE IDs	Uncorrelated pseudo random QPSK modulated data
Antenna transmission scheme	Same as used in PDCCH RMC	Same as used in PDSCH RMC
Subcarrier spacing	Same as used in PDCCH RMC	Same as used in PDSCH RMC
Aggregation level	Same as used in PDCCH RMC	N/A
Code rate	Same as used in PDCCH RMC	Same as used in PDSCH RMC
Transmit Power	Same as used in PDCCH RMC	Same as used in PDSCH RMC
CP length	Same as used in PDCCH RMC	Same as used in PDSCH RMC

Note 1: REs not used in the active CORESETs where PDCCH is scheduled for the UE under test.

Note 2: REs not allocated to any physical channels, CORESET, SSB or any other reference signal within the channel bandwidth of the cell.

Note 3: No OCNG is transmitted from the probe transmitting non-serving beam.

# A.3.2.1.3 OCNG pattern 3: Generic OCNG pattern for unused REs in the same bandwidth as PDSCH RMC

Table A.3.2.1.3-1: OP.3: Generic OCNG pattern for unused REs in the same BW as RMC

OCNG Parameters	Control Region	Data Region
Resource allocation	Unused REs (Note 1)	Unused REs (Note 2)
Channel	PDCCH	PDSCH
Contents	Virtual UE IDs	Uncorrelated pseudo random QPSK modulated data
Antenna transmission scheme	Same as used in PDCCH RMC	Same as used in PDSCH RMC
Subcarrier spacing	Same as used in PDCCH RMC	Same as used in PDSCH RMC
Aggregation level	Same as used in PDCCH RMC	N/A
Code rate	Same as used in PDCCH RMC	Same as used in PDSCH RMC
Transmit Power	Same as used in PDCCH RMC	Same as used in PDSCH RMC
CP length	Same as used in PDCCH RMC	Same as used in PDSCH RMC

Note 1: REs not used in the active CORESETs where PDCCH is scheduled for the UE under test. REs for OCNG shall not be allocated outside the allocated bandwidth of the PDSCH RMC of the serving cell.

Note 2: REs not allocated to any physical channels, CORESET, SSB or any other reference signal within the allocated bandwidth of the PDSCH RMC of the serving cell. REs for OCNG shall not be allocated outside the allocated bandwidth of the PDSCH RMC of the serving cell.

#### A.3.2.2 Void

### A.3.3 Reference DRX configurations

### A.3.3.1 DRX Configuration 1: DRX cycle = 40 ms and TAT = 500 ms

Table A.3.3.1-1: DRX.1: DRX cycle = 40 ms and time alignment timer (TAT) = 500 ms

Field	Value	
drx-onDurationTimer	1 ms	
drx-InactivityTimer	1 ms	
drx-RetransmissionTimerDL	1 slot	
drx-RetransmissionTimerUL	1 slot	
drx-LongCycleStartOffset	40 ms	
shortDRX	disable	
TimeAlignmentTimer	500 ms	
Note: This DRX configuration is applicable for NR serving cell. The DRX cycle and time alignment		

Note: This DRX configuration is applicable for NR serving cell. The DRX cycle and time alignment timer parameters are specified in clause 6.3.2 in TS 38.331 [2]

### A.3.3.2 DRX Configuration 2: DRX cycle = 640 ms and TAT = 500 ms

Table A.3.3.2-1: DRX.2: DRX cycle = 640 ms and time alignment timer (TAT) = 500 ms

Field	Value	
drx-onDurationTimer	1 ms	
drx-InactivityTimer	1 ms	
drx-RetransmissionTimerDL	1 slot	
drx-RetransmissionTimerUL	1 slot	
drx-LongCycleStartOffset	640 ms	
shortDRX	disable	
TimeAlignmentTimer	500 ms	
Note: This DRX configuration is applicable for NR serving cell. The DRX cycle and time alignment timer parameters are specified in clause 6.3.2 in TS 38.331 [2]		

### A.3.3.3 DRX Configuration 3: DRX cycle = 40 ms and TAT = Infinity

Table A.3.3.3-1: DRX.3: DRX cycle = 40 ms and time alignment timer (TAT) = Infinity

Field	Value	
drx-onDurationTimer	6 ms	
drx-InactivityTimer	1 ms	
drx-RetransmissionTimerDL	1 slot	
drx-RetransmissionTimerUL	1 slot	
drx-LongCycleStartOffset	40 ms	
shortDRX	disable	
TimeAlignmentTimer Infinity		
Note: This DRX configuration is applicable for NR serving cell. The DRX cycle and time alignment timer parameters are specified in clause 6.3.2 in TS 38.331 [2]		

### A.3.3.4 DRX Configuration 4: DRX cycle = 160 ms and TAT = Infinity

clause 6.3.2 in TS 36.331 [16].

Table A.3.3.4-1: DRX.4: DRX cycle = 160 ms and time alignment timer (TAT) = Infinity

Field	Value	
drx-onDurationTimer	psf2	
drx-InactivityTimer	psf2	
drx-RetransmissionTimer	Psf16	
longDRX-CycleStartOffset	sf160, 0	
shortDRX	disable	
TimeAlignmentTimer Infinity		
Note: This DRX configuration is applicable for E-UTRA serving cell. For further information see		

### A.3.3.5 DRX Configuration 5: DRX cycle = 320 ms and TAT = Infinity

Table A.3.3.5-1: DRX.5: DRX cycle = 320 ms and time alignment timer (TAT) = Infinity

Field	Value
drx-onDurationTimer	psf6
drx-InactivityTimer	psf1920
drx-RetransmissionTimer	psf16
longDRX-CycleStartOffset	sf320, 0
shortDRX	disable
TimeAlignmentTimer	Infinity
Note: This DRX configuration is applicable for E-UTRA serving cell. For further information see	
clause 6.3.2 in TS 36.331 [16].	

clause 6.3.2 in TS 36.331 [16].

### A.3.3.6 DRX Configuration 6: DRX cycle = 320 ms and TAT = 500 ms

Table A.3.3.6-1: DRX.6: DRX cycle = 320 ms and time alignment timer (TAT) = 500 ms

Field	Value
drx-onDurationTimer	1 ms
drx-InactivityTimer	1 ms
drx-RetransmissionTimerDL	1 slot
drx-RetransmissionTimerUL	1 slot
drx-LongCycleStartOffset	320 ms
shortDRX	disable
TimeAlignmentTimer	500 ms
Note: This DRX configuration is applicable for NR serving cell. The DRX cycle and time alignment	
timer parameters are specified in clause 6.3.2 in TS 38.331 [2]	

### A.3.3.7 DRX Configuration 7: DRX cycle = 640 ms and TAT = Infinity

Table A.3.3.7-1: DRX.7: DRX cycle = 640 ms and time alignment timer (TAT) = Infinity

Field	Value	
drx-onDurationTimer	6 ms	
drx-InactivityTimer	1 ms	
drx-RetransmissionTimerDL	1 slot	
drx-RetransmissionTimerUL	1 slot	
drx-LongCycleStartOffset	640 ms	
shortDRX	disable	
TimeAlignmentTimer	Infinity	
Note: This DRX configuration is applicable for NR serving cell. The DRX cycle and time alignment		
timer parameters are specified in clause 6.3.2 in TS 38.331 [2]		

### A.3.3.8 DRX Configuration 8: DRX cycle = 320 ms and TAT = Infinity

Table A.3.3.8-1: DRX.8: DRX cycle = 320 ms and time alignment timer (TAT) = Infinity

Field	Value
drx-onDurationTimer	6 ms
drx-InactivityTimer	1 ms
drx-RetransmissionTimerDL	1 slot
drx-RetransmissionTimerUL	1 slot
drx-LongCycleStartOffset	320 ms
shortDRX	disable
TimeAlignmentTimer	Infinity
Note: This DRX configuration is applicable for NR serving cell. The DRX cycle and time alignment timer parameters are specified in clause 6.3.2 in TS 38.331 [2]	

### A.3.3.9 DRX Configuration 9: DRX cycle = 40 ms and TAT = 500 ms

Table A.3.3.9-1: DRX.9: DRX cycle = 40 ms and time alignment timer (TAT) = 500 ms

Field	Value
drx-onDurationTimer	psf2
drx-InactivityTimer	psf100
drx-RetransmissionTimer	psf16
longDRX-CycleStartOffset	sf40, 0
shortDRX	disable
TimeAlignmentTimer	500 ms
Note: This DRX configuration is applicable for E-UTRA serving cell. For further information see	
clause 6.3.2 in TS 36.331 [16].	-

### A.3.3.10 DRX Configuration 10: DRX cycle = 640 ms

Table A.3.3.10-1: DRX.10: DRX cycle = 640 ms and time alignment timer (TAT) = 500 ms

Field	Value
drx-onDurationTimer	psf6
drx-InactivityTimer	psf1920
drx-RetransmissionTimer	psf16
longDRX-CycleStartOffset	sf640, 0
shortDRX	disable
TimeAlignmentTimer	500 ms
Note: This DRX configuration is applicable for E-UTRA serving cell. For further information see clause 6.3.2 in TS 36.331 [16].	

# A.3.3.11 DRX Configuration 11: DRX cycle = 20 ms and TAT = Infinity

Table A.3.3.11-1: DRX.11: DRX cycle = 20 ms and time alignment timer (TAT) = Infinity

Field	Value
drx-onDurationTimer	6 ms
drx-InactivityTimer	1 ms
drx-RetransmissionTimerDL	1 slot
drx-RetransmissionTimerUL	1 slot
drx-LongCycleStartOffset	20 ms
shortDRX	disable
TimeAlignmentTimer	Infinity
Note: This DRX configuration is applicable for NR serving cell. The DRX cycle and time alignment timer parameters are specified in clause 6.3.2 in TS 38.331 [2]	

### A.3.4 Test Cases with Different Channel Bandwidths

#### A.3.4.1 Test Cases with Different E-UTRA Channel Bandwidths

#### A.3.4.1.1 Introduction

In Annex A test cases involving E-UTRA cell(s) may be defined with different E-UTRA channel bandwidths to verify the same type of RRM requirement.

#### A.3.4.1.2 Principle of testing

If multiple test cases involving E-UTRA cell(s) are defined with different E-UTRA channel bandwidths to verify the same type of RRM requirement that is E-UTRA channel bandwidth independent, then the UE needs to be tested with only one channel bandwidth in each E-UTRA cell and with the same bandwidth in all the E-UTRA cells used in the test case.

# A.3.5 Test Cases for Synchronous and Asynchronous DC Operations

# A.3.5.1 EN-DC Test Cases for Synchronous and Asynchronous EN-DC Operations

#### A.3.5.1.1 Introduction

This clause defines a principle which is applicable to test cases verifying RRM requirements for EN-DC operation in synchronous and asynchronous scenarios.

In Annex A test cases may be defined in both synchronous EN-DC and asynchronous EN-DC scenarios to verify the same type of RRM requirement.

#### A.3.5.1.2 Principle of Testing

If EN-DC test cases are defined in both synchronous and asynchronous EN-DC scenarios to verify the same type of RRM requirement then the UE capable of both synchronous and asynchronous EN-DC operations needs to be tested with one of the tests in either synchronous or asynchronous EN-DC scenarios.

# A.3.6 Antenna configurations

# A.3.6.1 Antenna configurations for FR1

Unless otherwise specified, NR FDD or NR TDD cells in all RRM Test cases in AWGN propagation condition are configured with Antenna Configuration 1x2.

#### A.3.6.1.1 Antenna connection for 4 Rx capable UEs

#### A.3.6.1.1.1 Introduction

All tests in clause A.4 and A.6 are specified for UEs supporting 2RX. In this clause, the antenna connection method for applying 2RX tests to UEs supporting 4RX antenna ports is specified. No tests are currently specified in clause A.4 or A.6 which are applicable only to 4RX antenna ports, so 4RX capable UEs are always tested by reusing tests which were originally specified for 2RX UEs.

#### A.3.6.1.1.2 Principle of testing

#### A.3.6.1.1.2.1 Single carrier tests

For 4RX capable UEs supporting at least one 2RX band, the, all single carrier tests specified in clause A.4 and A.6 except those in A.4.7 and A.6.7 shall be tested on any band where 2RX is supported with the antenna connection specified in A.6.3.1.2.4. For single carrier tests specified in clause A.4.7 or A.6.7, all tests shall be tested with the antenna connection specified in A.3.6.1.1.2.4 for bands where 2RX is supported, and the antenna connection specified in A.3.6.1.1.2.5 for bands where 4RX is supported.

For 4RX capable UEs which do not support any 2RX band, all tests specified in clauses A.4 and A.6 shall be tested using the antenna connection specified in clause A.3.6.1.1.2.5. For radio link monitoring tests, the SNR levels are modified according to table A.3.6.1.1.2.1-1 and table A.3.6.1.1.2.1-2

Table A.3.6.1.1.2.1-1: Modified parameters for RLM out of sync testing with 4 RX antenna connection

Test case	SNR during T3 (dB)			
	Test 1	Test 2	Test 3	Test 4
A.4.5.1.1	-18	N/A	N/A	N/A
A.4.5.1.3	-18	N/A	N/A	N/A
A.4.5.1.5	-18	N/A	N/A	N/A
A.4.5.1.7	-18	N/A	N/A	N/A
A.5.5.1.1	-18	N/A	N/A	N/A
A.5.5.1.3	-18	N/A	N/A	N/A
A.5.5.1.5	-18	N/A	N/A	N/A
A.5.5.1.7	-18	N/A	N/A	N/A
A.6.5.1.1	-18	N/A	N/A	N/A
A.6.5.1.3	-18	N/A	N/A	N/A
A.6.5.1.5	-18	N/A	N/A	N/A
A.6.5.1.7	-18	N/A	N/A	N/A
A.7.5.1.1	-18	N/A	N/A	N/A
A.7.5.1.3	-18	N/A	N/A	N/A
A.7.5.1.5	-18	N/A	N/A	N/A
A.7.5.1.7	-18	N/A	N/A	N/A

Table A.3.6.1.1.2.1-2: Modified parameters for RLM in sync single carrier testing with 4 RX antenna connection

Test case	SNR during T3 (dB)		SNR during T4 (d	g T4 (dB)
	Test 1	Test 2	Test 1	Test 2
A.4.5.1.2	-18	N/A	-8	N/A
A.4.5.1.4	-18	N/A	-8	N/A
A.4.5.1.6	-18	N/A	-8	N/A
A.4.5.1.8	-18	N/A	-8	N/A
A.5.5.1.2	-18	N/A	-8	N/A
A.5.5.1.4	-18	N/A	-8	N/A
A.5.5.1.6	-18	N/A	-8	N/A
A.5.5.1.8	-18	N/A	-8	N/A
A.6.5.1.2	-18	N/A	-8	N/A
A.6.5.1.4	-18	N/A	-8	N/A
A.6.5.1.6	-18	N/A	-8	N/A
A.6.5.1.8	-18	N/A	-8	N/A
A.7.5.1.2	-18	N/A	-8	N/A
A.7.5.1.4	-18	N/A	-8	N/A
A.7.5.1.6	-18	N/A	-8	N/A
A.7.5.1.8	-18	N/A	-8	N/A

Table A.3.6.1.1.2.1-3: Modified parameters for Beam Failure Detection and Link Recovery testing with 4 RX antenna connection

Test case	SNR during T3 (dB)
	Test 1
A.4.5.5.1	-15
A.4.5.5.2	-15
A.4.5.5.3	-15
A.4.5.5.4	-15
A.5.5.5.1	-15
A.5.5.5.2	-15
A.5.5.5.3	-15
A.5.5.5.4	-15
A.6.5.5.1	-15
A.6.5.5.2	-15
A.6.5.5.3	-15
A.6.5.5.4	-15
A.7.5.5.1	-15
A.7.5.5.2	-15
A.7.5.5.3	-15
A.7.5.5.4	-15

#### A.3.6.1.1.2.2 Carrier aggregation tests

All carrier aggregation tests are performed using the antenna connection in clause A.3.6.1.1.2.4 for the PCell antenna connection if the PCell is on a band where 2RX is supported or the antenna connection in A.3.6.1.1.2.5 for the PCell antenna connection if the PCell is on a band where 4RX is supported.

All carrier aggregation tests are performed using the antenna connection in clause A.3.6.1.1.2.4 for the SCell antenna connection if an SCell is on band where 2RX is supported or the testing procedure in A.3.6.1.1.2.5 for the SCell antenna connection if an SCell is on a band where 4RX is supported.

#### A.3.6.1.1.2.3 EN-DC tests

All carrier aggregation tests are performed using the antenna connection in clause A.3.6.1.1.2.6 for the PCell antenna connection if the PCell is on a band where 2RX is supported or the antenna connection in A.3.6.1.1.2.7 for the PCell antenna connection if the PCell is on a band where 4RX is supported.

All carrier aggregation tests are performed using the antenna connection in clause A.3.6.1.1.2.4 for the PSCell or SCell antenna connection if an SCell is on band where 2RX is supported or the testing procedure in A.3.6.1.1.2.5 for the SCell antenna connection if an SCell or PSCell is on a band where 4RX is supported.

#### A.3.6.1.1.2.4 Antenna connection for bands where 2RX is supported

For bands where 2RX is supported, it is left to the UE declaration and AP configuration to decide which 2 of the 4 Rx ports are connected with data source from system simulator. The remaining 2 Rx ports shall be connected with zero input. No test parameters or requirements are modified.

#### A.3.6.1.1.2.5 Antenna connection for bands where 4RX is supported

For bands where 4RX is supported, all 4 RX antennas are connected with data source from system simulator. The system simulator shall provide independent noise and fading (low correlation) for each antenna port. Except for the modifications to radio link monitoring thresholds described in clauses A.3.6.1.1.2.1 and A.3.6.1.1.2.2, no test parameters or requirements are modified.

#### A.3.6.1.1.2.6 EN-DC LTE Antenna connection for bands where 2RX is supported

For bands where LTE 2RX is supported, it is left to the UE declaration and AP configuration to decide which 2 of the 4 Rx ports are connected with data source from system simulator. The remaining 2 Rx ports shall be connected with zero input. No test parameters or requirements are modified.

#### A.3.6.1.1.2.7 EN-DC LTE Antenna connection for bands where 4RX is supported

For bands where LTE 4RX is supported, all 4 RX antennas are connected with data source from system simulator. The system simulator shall provide independent noise and fading (low correlation) for each antenna port. Except for the modifications to radio link monitoring thresholds described in clauses A.3.8.1.2.1 and A.3.8.1.2.2 of TS 36.133 [15], no test parameters or requirements are modified.

## A.3.6.2 Antenna configurations for FR2

Unless otherwise specified, the default Downlink Antenna Configuration for NR FR2 cells is 1x2.

In case of Downlink Antenna Configuration 2x2 for NR FR2 cells, unless otherwise specified, the downlink signal is transmitted over the two polarizations (V and H) of the dual polarized antenna of the test equipment.

In both cases, the downlink signal is received assuming 2 UE baseband receivers. As the UE is tested following the Blackbox Approach with regard to the UE Rx antennas, the exact UE Rx antenna configuration is not relevant for the test configuration and has no impact on the test implementation.

# A.3.7 EN-DC test setup

#### A.3.7.1 Introduction

## A.3.7.2 E-UTRAN Serving Cell Parameters

#### A.3.7.2.1 E-UTRAN Serving Cell Parameters for Tests with NR Cell(s) in FR1

Table A.3.7.2.1-1 defines cell specific test parameters for E-UTRAN cell which can be used in EN-DC test cases or in any test case comprising at least one E-UTRA serving cell with all NR cells in FR1. Unless otherwise stated within the test, all measurements in Annex A.4 and A.5 are performed only on the NR carrier. The E-UTRA PCell

shall configured to not interfere with NR operation and the E-UTRA PCell signal power shall not be critical to the test purpose.

Table A.3.7.2.1-1: E-UTRAN cell specific test parameters for tests with all NR cells in FR1

E-UTRA RF Channel Number  Duplex mode  Duplex mode  FDD or TDD  TDD special subframe configuration Number  BWchannel  BWchannel  S MHz: NRsc = 25  10 MHz: NRsc = 50  20 MHz: NRsc = 50  20 MHz: Rs = 100  PDSCH parameters:  DL Reference Measurement Channel Number  DL MHz: R-11 FDD  10 MHz: R-11 FDD  10 MHz: R-11 FDD  20 MHz: R-10 FDD  20 MHz: R-11 FDD  20 MHz: R-11 FDD  20 MHz: R-11 FDD  20 MHz: R-11 FDD  20 MHz: R-10 FDD	Parameter	Unit	E-UTRAN Cell1
Duplex mode	F-LITRA RE Channel Number		1
TDD special subframe configuration   Note   1   1   1   1   1   1   1   1   1			· ·
TDD uplink-downlink configuration   S MHz: NRB,c = 25	TDD special subframe configuration Note1		
BWchannel	TDD unlink-downlink configuration <sup>Note1</sup>		_
10 MHz: Nas_ = 50   20 MHz: Nas_ = 100			•
Description	DVV Channer		
PDSCH parameters:			
DL Reference Measurement Channel Note2   20 MHz: R.3 FDD   20 MHz: R.4 TDD   10 MHz: R.4 TDD   10 MHz: R.0 TDD   20 MHz: R.1 TDD   20 MHz: R.1 TDD   20 MHz: R.1 TFDD   20 MHz: R.1 TFDD   20 MHz: R.1 TFDD   20 MHz: R.1 TFDD   20 MHz: R.1 TDD   2	PDSCH parameters:		5 MHz: R.7 FDD
20 MHz: R.6 FDD   5 MHz: R.3 TDD   10 MHz: R.3 TDD   20 MHz: R.11 FDD   20 MHz: R.10 FDD   20 MHz: R.10 FDD   20 MHz: R.10 FDD   20 MHz: R.10 FDD   5 MHz: R.11 TDD   10 MHz: R.6 FDD   20 MHz: R.10 TDD   20 MHz: R.10 TDD   20 MHz: R.10 TDD   20 MHz: CP.10 FDD   20 MHz: CP.	DL Reference Measurement Channel <sup>Note2</sup>		
10 MHz; R, 0 TDD 20 MHz; R, 3 TDD 20 MHz; R, 11 FDD 10 MHz; R, 6 FDD 20 MHz; R, 10 FDD 5 MHz; R, 11 TDD 10 MHz; R, 6 TDD 20 MHz; R, 10 TDD 20 MHz; CP, 10 FDD 10 MHz; OP, 20 FDD 10 MHz; OP, 10 FDD 20 MHz; OP, 17 FDD 5 MHz; OP, 9 TDD 10 MHz; OP, 9 TDD 10 MHz; OP, 7 TDD 20 MHz; OP, 7 T			20 MHz: R.6 FDD
PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel Note2 DL Reference Measurement Channel Note3 DL Reference Measurement Channel Note Abrush Channel Note Abr			5 MHz: R.4 TDD
PCFICH/PDCCH/PHICH parameters: DL Reference Measurement ChannelNote2			10 MHz: R.0 TDD
DL Reference Measurement ChannelNote2			
20 MHz: R.10 FDD   5 MHz: R.11 TDD   10 MHz: R.6 TDD   20 MHz: R.10 TDD   20 MHz: R.10 TDD   20 MHz: R.10 TDD   20 MHz: R.10 TDD   20 MHz: OP.20 FDD   10 MHz: OP.10 FDD   20 MHz: OP.17 FDD   5 MHz: OP.9 TDD   10 MHz: OP.1 TDD   20 MHz: OP.7 TDD   20 MHz: OP.	PCFICH/PDCCH/PHICH parameters:		5 MHz: R.11 FDD
S MHz: R.11 TDD	DL Reference Measurement Channel <sup>Note2</sup>		10 MHz: R.6 FDD
10 MHz: R.6 TDD   20 MHz: R.10 TDD   20 MHz: R.10 TDD   5 MHz: OP.20 FDD   10 MHz: OP.10 FDD   20 MHz: OP.17 FDD   20 MHz: OP.17 FDD   5 MHz: OP.9 TDD   10 MHz: OP.1 TDD   20 MHz: OP.7 TDD   5 MHz: OP.7 TDD   10 MHz: OP.7 TDD   10 MHz: OP.7 TDD   20 MHz: OP.			20 MHz: R.10 FDD
20 MHz: R.10 TDD			5 MHz: R.11 TDD
OCNG Patterns Note2         5 MHz: OP.20 FDD           10 MHz: OP.10 FDD         20 MHz: OP.17 FDD           20 MHz: OP.9 TDD         5 MHz: OP.9 TDD           10 MHz: OP.1 TDD         20 MHz: OP.7 TDD           PBCH_RA         dB           PBCH_RB         dB           PSS_RA         dB           SSS_RA         dB           PCFICH_RB         dB           PHICH_RA         dB           PDCCH_RB         dB           PDCCH_RB         dB           PDSCH_RA         dB           PDSCH_RA         dB           PDSCH_RB         dB           OCNG_RANote3         dB           OCNG_RBNote3         dB           OCNG_RBNote3         dB           OCNG_RBNote4         dBm/15 kHz         -104           Ès/Noc         dB         17           Ès/Noc         dB         17           SCH_RP Note5         dBm/15 kHz         -87           SCH_RP Note5         dBm/15 kHz         -59.13+10log(N <sub>RB,c</sub> /50)           Propagation Condition         AWGN			10 MHz: R.6 TDD
10 MHz: OP.10 FDD   20 MHz: OP.17 FDD   5 MHz: OP.9 TDD   10 MHz: OP.1 TDD   10 MHz: OP.1 TDD   20 MHz: OP.7 TDD   10 MHz: OP.7 TDD   20 MHz: OP			
20 MHz: OP.17 FDD   5 MHz: OP.9 TDD   10 MHz: OP.1 TDD   20 MHz: OP.7 TDD   20 MHz: OP.	OCNG Patterns <sup>Note2</sup>		
S MHz: OP.9 TDD   10 MHz: OP.1 TDD   20 MHz: OP.7			
10 MHz: OP.1 TDD   20 MHz: OP.7 TDD			
20 MHz: OP.7 TDD			
PBCH_RA         dB           PBCH_RB         dB           PSS_RA         dB           SSS_RA         dB           PCFICH_RB         dB           PHICH_RA         dB           PHICH_RB         dB           PDCCH_RB         dB           PDCCH_RB         dB           PDSCH_RA         dB           PDSCH_RB         dB           OCNG_RANote3         dB           OCNG_RBNote3         dB           No_cNote4         dBm/15 kHz         -104           Ès/Noc         dB         17           Ès/lot         dB         17           SCH_RP Note5         dBm/15 kHz         -87           SCH_RP Note5         dBm/15 kHz         -87           Io Note5         dBm/15 kHz         -87           Io Note5         dBm/Ch BW         -59.13+10log(N <sub>RB,c</sub> /50)           Propagation Condition         AWGN			
PBCH_RB         dB           PSS_RA         dB           SSS_RA         dB           PCFICH_RB         dB           PHICH_RA         dB           PHICH_RB         dB           PDCCH_RA         dB           PDCCH_RB         dB           PDSCH_RA         dB           PDSCH_RA         dB           OCNG_RANote3         dB           OCNG_RANote3         dB           OCNG_ROTE4         dBM/15 kHz           Iotal         dB           17         Es/Noc           dB         17           RSRP Note5         dB M/15 kHz           SCH_RP Note5         dBm/15 kHz           SCH_RP Note5         dBm/15 kHz           Io Note5         dBm/Ch_BW           -59.13+10log(N <sub>RB,c</sub> /50)           Propagation Condition         AWGN	PBCH RA	dB	20 MHZ. OP.7 TDD
PSS_RA         dB           SSS_RA         dB           PCFICH_RB         dB           PHICH_RA         dB           PHICH_RB         dB           PDCCH_RA         dB           PDCCH_RB         dB           PDSCH_RA         dB           PDSCH_RB         dB           OCNG_RANote3         dB           OCNG_RBNote3         dB           NocNote4         dBM/15 kHz         -104           Ēs/Noc         dB         17           Ēs/Iot         dB         17           RSRP Note5         dBM/15 kHz         -87           SCH_RP Note5         dBm/15 kHz         -87           Io Note5         dBm/Ch BW         -59.13+10log(N <sub>RB,c</sub> /50)           Propagation Condition         AWGN			
SSS_RA         dB           PCFICH_RB         dB           PHICH_RA         dB           PHICH_RB         dB           PDCCH_RA         dB           PDCCH_RB         dB           PDSCH_RA         dB           PDSCH_RB         dB           OCNG_RANote3         dB           OCNG_RBNote3         dB           Noc_Note4         dBM/15 kHz           Es/Noc         dB         17           Es/Not         dB         17           RSRP_Note5         dBM/15 kHz         -87           SCH_RP_Note5         dBm/15 kHz         -87           SCH_RP_Note5         dBm/15 kHz         -87           Io Note5         dBm/Ch BW         -59.13+10log(N <sub>RB,c</sub> /50)           Propagation Condition         AWGN			
PCFICH_RB         dB           PHICH_RA         dB           PHICH_RB         dB           PDCCH_RA         dB           PDCCH_RB         dB           PDSCH_RA         dB           PDSCH_RB         dB           OCNG_RANote3         dB           OCNG_RBNote3         dB           Noc_Note4         dBm/15 kHz           Es/Noc         dB           dB         17           RSRP_Note5         dBm/15 kHz           SCH_RP_Note5         dBm/15 kHz           Io Note5         dBm/Ch BW           Propagation Condition         AWGN			
PHICH_RA         dB           PHICH_RB         dB           PDCCH_RA         dB           PDCCH_RB         dB           PDSCH_RA         dB           PDSCH_RB         dB           OCNG_RANote3         dB           OCNG_RBNote3         dB           NocNote4         dBm/15 kHz         -104           Ès/Noc         dB         17           Ès/Iot         dB         17           RSRP Note5         dBm/15 kHz         -87           SCH_RP Note5         dBm/15 kHz         -87           Io Note5         dBm/Ch BW         -59.13+10log(N <sub>RB,c</sub> /50)           Propagation Condition         AWGN			
PHICH_RB         dB         0           PDCCH_RA         dB         0           PDCCH_RB         dB         0           PDSCH_RA         dB         0           PDSCH_RB         dB         0           OCNG_RANote3         dB         0           OCNG_RBNote3         dB         10           NocNote4         dBm/15 kHz         -104           Ês/Noc         dB         17           Ês/Iot         dB         17           RSRP Note5         dBm/15 kHz         -87           SCH_RP Note5         dBm/15 kHz         -87           Io Note5         dBm/Ch BW         -59.13+10log(N <sub>RB,c</sub> /50)           Propagation Condition         AWGN			
PDCCH_RA         dB           PDCCH_RB         dB           PDSCH_RA         dB           PDSCH_RB         dB           OCNG_RANote3         dB           OCNG_RBNote3         dB           NocNote4         dBm/15 kHz         -104           Ês/Noc         dB         17           Ês/Iot         dB         17           RSRP Note5         dBm/15 kHz         -87           SCH_RP Note5         dBm/15 kHz         -87           Io Note5         dBm/Ch BW         -59.13+10log(N <sub>RB,c</sub> /50)           Propagation Condition         AWGN			0
PDCCH_RB         dB           PDSCH_RA         dB           PDSCH_RB         dB           OCNG_RANote3         dB           OCNG_RBNote3         dB           NocNote4         dBm/15 kHz         -104           Ês/Noc         dB         17           Ês/Iot         dB         17           RSRP Note5         dBm/15 kHz         -87           SCH_RP Note5         dBm/15 kHz         -87           Io Note5         dBm/Ch BW         -59.13+10log(N <sub>RB,c</sub> /50)           Propagation Condition         AWGN			
PDSCH RB         dB           OCNG RANote3         dB           OCNG RBNote3         dB           NocNote4         dBm/15 kHz         -104           Ês/Noc         dB         17           Ês/Iot         dB         17           RSRP Note5         dBm/15 kHz         -87           SCH_RP Note5         dBm/15 kHz         -87           Io Note5         dBm/Ch BW         -59.13+10log(N <sub>RB,c</sub> /50)           Propagation Condition         AWGN		dB	
OCNG_RANote3         dB           OCNG_RBNote3         dB           NocNote4         dBm/15 kHz         -104           Ês/Noc         dB         17           Ês/Iot         dB         17           RSRP Note5         dBm/15 kHz         -87           SCH_RP Note5         dBm/15 kHz         -87           SCH_RP Note5         dBm/15 kHz         -59.13+10log(N <sub>RB,c</sub> /50)           Propagation Condition         AWGN	PDSCH RA	dB	
OCNG RBNote3         dB           NocNote4         dBm/15 kHz         -104           Ês/Noc         dB         17           Ês/Iot         dB         17           RSRP Note5         dBm/15 kHz         -87           SCH_RP Note5         dBm/15 kHz         -87           Io Note5         dBm/Ch BW         -59.13+10log(N <sub>RB,c</sub> /50)           Propagation Condition         AWGN	PDSCH RB	dB	
OCNG RBNote3         dB           NocNote4         dBm/15 kHz         -104           Ês/Noc         dB         17           Ês/Iot         dB         17           RSRP Note5         dBm/15 kHz         -87           SCH_RP Note5         dBm/15 kHz         -87           Io Note5         dBm/Ch BW         -59.13+10log(N <sub>RB,c</sub> /50)           Propagation Condition         AWGN		dB	
Ês/Noc         dB         17           Ês/Iot         dB         17           RSRP Note5         dBm/15 kHz         -87           SCH_RP Note5         dBm/15 kHz         -87           Io Note5         dBm/Ch BW         -59.13+10log(N <sub>RB,c</sub> /50)           Propagation Condition         AWGN	OCNG RB <sup>Note3</sup>		
Ê <sub>s</sub> /I <sub>ot</sub> dB         17           RSRP Note5         dBm/15 kHz         -87           SCH_RP Note5         dBm/15 kHz         -87           Io Note5         dBm/Ch BW         -59.13+10log(N <sub>RB,c</sub> /50)           Propagation Condition         AWGN	N <sub>oc</sub> Note4	dBm/15 kHz	-104
Ê <sub>s</sub> /I <sub>ot</sub> dB         17           RSRP Note5         dBm/15 kHz         -87           SCH_RP Note5         dBm/15 kHz         -87           Io Note5         dBm/Ch BW         -59.13+10log(N <sub>RB,c</sub> /50)           Propagation Condition         AWGN	Ês/Noc	dB	17
RSRP Note5         dBm/15 kHz         -87           SCH_RP Note5         dBm/15 kHz         -87           Io Note5         dBm/Ch BW         -59.13+10log(N <sub>RB,c</sub> /50)           Propagation Condition         AWGN	Ê <sub>s</sub> /I <sub>ot</sub>	dB	17
SCH_RP Note5         dBm/15 kHz         -87           Io Note5         dBm/Ch BW         -59.13+10log(N <sub>RB,c</sub> /50)           Propagation Condition         AWGN	RSRP Note5	dBm/15 kHz	-87
Io Note5 dBm/Ch BW -59.13+10log(N <sub>RB,c</sub> /50) Propagation Condition AWGN	SCH RP Note5		
Propagation Condition AWGN	lo Note5		

Note 1:	Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211.
Note 2:	DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 respectively.
Note 3:	OCNG shall be used such that all cells are fully allocated and a constant total transmitted power
	spectral density is achieved for all OFDM symbols.
Note 4:	Interference from other cells and noise sources not specified in the test is assumed to be constant
	over subcarriers and time and shall be modelled as AWGN of appropriate power for N₀c to be
	fulfilled.
Note 5:	E <sub>s</sub> /I <sub>ot</sub> , RSRP, SCH RP and Io levels have been derived from other parameters for information
	purposes. They are not settable parameters themselves.

## A.3.7.2.2 E-UTRAN Serving Cell Parameters for Tests with NR Cell(s) in FR2

Table A.3.7.2.2-1 defines cell specific test parameters for E-UTRAN cell which can be used in EN-DC test cases or in any test case comprising at least one E-UTRA serving cell with one or more NR cells in FR2.

Table A.3.7.2.2-1: E-UTRAN cell specific test parameters for tests with one or more NR cells in FR2

Parameter	Unit	E-UTRAN Cell1
E-UTRA RF Channel Number		1
Duplex mode		FDD or TDD
TDD special subframe configuration <sup>Note1</sup>		6
TDD uplink-downlink configuration <sup>Note1</sup>		1
BWchannel	MHz	5 MHz: N <sub>RB,c</sub> = 25
		10 MHz: N <sub>RB,c</sub> = 50
		20 MHz: N <sub>RB,c</sub> = 100
PDSCH parameters:		5 MHz: R.7 FDD
DL Reference Measurement Channel <sup>Note2</sup>		10 MHz: R.3 FDD
		20 MHz: R.6 FDD
		5 MHz: R.4 TDD
		10 MHz: R.0 TDD
		20 MHz: R.3 TDD
PCFICH/PDCCH/PHICH parameters:		5 MHz: R.11 FDD
DL Reference Measurement Channel <sup>Note2</sup>		10 MHz: R.6 FDD
		20 MHz: R.10 FDD
		5 MHz: R.11 TDD
		10 MHz: R.6 TDD
		20 MHz: R.10 TDD
OCNG Patterns <sup>Note2</sup>		5 MHz: OP.20 FDD
		10 MHz: OP.10 FDD
		20 MHz: OP.17 FDD
		5 MHz: OP.9 TDD
		10 MHz: OP.1 TDD
		20 MHz: OP.7 TDD
PBCH_RA	dB	
PBCH_RB	dB	
PSS_RA	dB	
SSS_RA	dB	
PCFICH_RB	dB	
PHICH_RA	dB	
PHICH_RB	dB	0
PDCCH_RA	dB	
PDCCH_RB	dB	
PDSCH_RA	dB	
PDSCH_RB	dB	
OCNG_RA <sup>Note3</sup>	dB	
OCNG_RB <sup>Note3</sup>	dB	

Note 1:	Special subtrame and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211.
Note 2:	DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 respectively.
Note 3:	OCNG shall be used such that all cells are fully allocated and a constant total transmitted power
	spectral density is achieved for all OFDM symbols.
Note 4:	The E-UTRA signal is required only to ensure the E-UTRA link to the DUT in the EN-DC operation.
	The Test System shall provide a stable and noise-free E-UTRA signal without need of precise
	propagation modelling, path loss and polarization control. Further details of the E-UTRA signal
	configuration are not defined as part of the cell specific test parameters, since the E-UTRA link is not
	under performance verification and is not expected to influence the NR FR2 requirement.

## A.3.7A NR FR1-FR2 test setup

Some Test cases in clause A.7 have NR cells in both FR1 and FR2. Unless otherwise stated within the test, the NR FR1 Cell signal is required only to provide a link to the UE under test. The Test System shall provide a stable and noise-free NR FR1 signal without need of precise propagation modelling, path loss and polarization control. Further details of the NR FR1 signal configuration are not defined as part of the cell specific test parameters, since the NR FR1 link is not under performance verification and is not expected to influence the test purpose.

# A.3.8 PRACH configurations

#### A.3.8.1 Introduction

This clause provides the typical PRACH configurations used for RRM test cases defined in Annex A. To note that for other parameters not listed in this clause, either it can be derived from the set up of each test or it is subjected to RAN5 specifications.

## A.3.8.2 PRACH configurations in FR1

### A.3.8.2.1 FR1 PRACH configuration 1

FR1 PRACH configuration 1 in this clause provides the typical PRACH configuration for SSB-based contention based random access in FR1.

Table A.3.8.2.1-1: Parameters for FR1 PRACH configuration 1

Field	Value	Comment
prach-ConfigurationIndex	102	10ms PRACH periodicity, and other detailed
		configuration defined in table 6.3.3.2-2 and table 6.3.3.2-
		3 in TS 38.211 [6].
msg1-SubcarrierSpacing	Same as UL	
	carrier SCS	
totalNumberOfRA-Preambles	48	Total number of preambles used for contention based
		and contention free random access
numberOfRA-PreamblesGroupA	48	No group B.
prach-RootSequenceIndex	0	Logic sequence index = 0, resulting in root sequence =
		1.
ssb-perRACH-OccasionAndCB-	oneFourth, n48	OneFourth: 1 SSB associated with 4 RACH occasions
PreamblesPerSSB		n48: 48 contention based preambles per SSB
msg1-FDM	One	One PRACH transmission occasions FDMed in one time
		instance.
rsrp-ThresholdSSB	RSRP_51	The actual value of the threshold is -105dBm, as defined in TS 38.331 [2].
ra-ContentionResolutionTimer	sf48	48 sub-frames
_	dB2	40 Sub-Italiles
powerRampingStep	*	
preambleReceivedTargetPower	dBm-120	
preambleTransMax	n6	Max number of RA preamble transmission performed
		before declaring a failure is 6
ra-ResponseWindow	sl10	10 slots
zeroCorrelationZoneConfig	11	N-CS configuration, N <sub>CS</sub> = 23
Backoff Parameter Index	2	20ms, as defined in table 7.2-1 in TS 38.321 [7].
Note: For further information s	ee clause 6.3.2 in T	S 38.331 [2].

## A.3.8.2.2 FR1 PRACH configuration 2

FR1 PRACH configuration 2 in this clause provides the typical PRACH configuration for SSB based non-contention based random access in FR1.

Table A.3.8.2.2-1: Parameters for FR1 PRACH configuration 2

Field	Value	Comment	
prach-ConfigurationIndex	102	10ms PRACH periodicity, and other detailed configuration defined in table 6.3.3.2-2 and table 6.3.3.2-3 in TS 38.211 [6].	
msg1-SubcarrierSpacing	Same as UL carrier SCS		
totalNumberOfRA-Preambles	48	Total number of preambles used for contention based and contention free random access	
numberOfRA-PreamblesGroupA	48	No group B.	
prach-RootSequenceIndex	0	Logic sequence index = 0, resulting in root sequence = 1.	
ssb-perRACH-Occasion	oneFourth	OneFourth: 1 SSB associated with 4 RACH occasions	
msg1-FDM	One	One PRACH transmission occasions FDMed in one time instance.	
powerRampingStep	dB2		
preambleReceivedTargetPower	dBm-120		
preambleTransMax	n6	Max number of RA preamble transmission performed before declaring a failure is 6	
ra-ResponseWindow	sl10	10 slots	
zeroCorrelationZoneConfig	11	N-CS configuration, N <sub>CS</sub> = 23	
Backoff Parameter Index	2	20ms, as defined in table 7.2-1 in TS 38.321 [7].	
ssb-ResourceList	ra-PreambleIndex = 50	Associated with SSB index 0. UE doesn't use ssb-ResourceList and BFR-SSB-Resource IEs at the same time. UE doesn't use this field if is transmitting CFRA to convey BFR.	
BFR-SSB-Resource	ra-PreambleIndex = 50	Associated with SSB index 0. UE doesn't use ssb-ResourceList and BFR-SSB-Resource IEs at the same time. UE uses this field only if is transmitting CFRA to convey BFR	
ra-ssb-OccasionMaskIndex	1	PRACH occasion index 1 is allowed	
rsrp-ThresholdSSB	RSRP_51	The actual value of the threshold is - 105dBm, as defined in TS 38.331 [2].	
Note: For further information see clause 6.3.2 in TS 38.331 [2].			

# A.3.8.2.3 FR1 PRACH configuration 3

FR1 PRACH configuration 3 in this clause provides the typical PRACH configuration for CSI-RS based non-contention based random access in FR1.

Table A.3.8.2.3-1: Parameters for FR1 PRACH configuration 3

Field	Value	Comment		
prach-ConfigurationIndex	102	10ms PRACH periodicity, and other detailed		
		configuration defined in table 6.3.3.2-2 and		
		table 6.3.3.2-3 in TS 38.211 [6].		
msg1-SubcarrierSpacing	Same as UL carrier SCS			
totalNumberOfRA-Preambles	48	Total number of preambles used for		
		contention based and contention free		
		random access		
numberOfRA-PreamblesGroupA	48	No group B.		
prach-RootSequenceIndex	0	Logic sequence index = 0, resulting in root		
		sequence = 1.		
ssb-perRACH-Occasion	oneFourth	OneFourth: 1 SSB associated with 4 RACH		
		occasions		
msg1-FDM	One	One PRACH transmission occasions		
		FDMed in one time instance.		
powerRampingStep	dB2			
preambleReceivedTargetPower	dBm-120			
preambleTransMax	n6	Max number of RA preamble transmission		
		performed before declaring a failure is 6		
ra-ResponseWindow	sl10	10 slots		
zeroCorrelationZoneConfig	11	N-CS configuration, N <sub>CS</sub> = 23		
Backoff Parameter Index	2	20ms, as defined in table 7.2-1 in TS 38.321		
		[7].		
csirs-ResourceList	ra-PreambleIndex = 50	Associated with CSI-RS configured		
ra-OccasionList	1	RA occasions allowed corresponding to		
		CSI-RS		
rsrp-ThresholdCSI-RS	RSRP_51	The actual value of the threshold is -		
		105dBm, as defined in TS 38.331 [2].		
Note: For further information see clause 6.3.2 in TS 38.331 [2].				

# A.3.8.2.4 FR1 PRACH configuration 4

FR1 PRACH configuration 4 in this clause provides the PRACH configuration for CSI-RS based non-contention based random access in FR1 to convey BFR.

Table A.3.8.2.4-1: Parameters for FR1 PRACH configuration 4

Field	Value	Comment
prach-ConfigurationIndex	8	10ms PRACH periodicity, and other detailed configuration defined in table 6.3.3.2-2 and table 6.3.3.2-3 in TS 38.211 [6].
totalNumberOfRA-Preambles	48	Total number of preambles used for contention based and contention free random access
numberOfRA-PreamblesGroupA	48	No group B.
prach-RootSequenceIndex	0	Logic sequence index = 0, resulting in root sequence = 1.
ssb-perRACH-Occasion	oneFourth	OneFourth: 1 SSB associated with 4 RACH occasions
msg1-FDM	One	One PRACH transmission occasions FDMed in one time instance.
powerRampingStep	dB2	
preambleReceivedTargetPower	dBm-120	
preambleTransMax	n200	Max number of RA preamble transmission performed before declaring a failure is 200
ra-ResponseWindow	sl1	1 slot
zeroCorrelationZoneConfig	11	N-CS configuration, N <sub>CS</sub> = 93
Backoff Parameter Index	2	20ms, as defined in table 7.2-1 in TS 38.321 [7].
BFR-CSIRS-Resource	ra-PreambleIndex = 50	Associated with CSI-RS configured
ra-OccasionList	1	RA occasions allowed corresponding to CSI-RS
rsrp-ThresholdSSB	RSRP_51	The actual value of the threshold is - 105dBm, as defined in TS 38.331 [2].
Note: For further information se	e clause 6.3.2 in TS 38.331 [2	].

# A.3.8.3 PRACH configurations in FR2

## A.3.8.3.1 FR2 PRACH configuration 1

FR2 PRACH configuration 1 in this clause provides the typical PRACH configuration for SSB-based contention based random access in FR2.

Table A.3.8.3.1-1: Parameters for FR2 PRACH configuration 1

Field	Value	Comment
prach-ConfigurationIndex	190	Preamble Format C2, with 10ms PRACH periodicity, and other detailed configuration defined in table 6.3.3.2-4 in TS 38.211 [6].
msg1-SubcarrierSpacing	Same as UL carrier SCS	
totalNumberOfRA-Preambles	48	Total number of preambles used for contention based and contention free random access
numberOfRA-PreamblesGroupA	48	No group B.
prach-RootSequenceIndex	0	Logic sequence index = 0, resulting in root sequence = 1.
ssb-perRACH-OccasionAndCB- PreamblesPerSSB	oneFourth, n48	OneFourth: 1 SSB associated with 4 RACH occasions n48: 48 contention based preambles per SSB
msg1-FDM	One	One PRACH transmission occasions FDMed in one time instance.
rsrp-ThresholdSSB	RSRP_51	The actual value of the threshold is -105dBm, as defined in TS 38.331 [2].
ra-ContentionResolutionTimer	sf48	48 sub-frames
powerRampingStep	dB2	
preambleReceivedTargetPower	dBm-120	
preambleTransMax	n6	Max number of RA preamble transmission performed before declaring a failure is 6
ra-ResponseWindow	sl10	10 slots
zeroCorrelationZoneConfig	11	N-CS configuration, N <sub>CS</sub> = 23
Backoff Parameter Index	2	20 ms, as defined in table 7.2-1 in TS 38.321 [7].
Note: For further information s	ee clause 6.3.2 in T	S 38.331 [2].

# A.3.8.3.2 FR2 PRACH configuration 2

FR2 PRACH configuration 2 in this clause provides the typical PRACH configuration for SSB based non-contention based random access in FR2.

Table A.3.8.3.2-1: Parameters for FR2 PRACH configuration 2

Field	Value	Comment	
prach-ConfigurationIndex	190	Preamble Format C2, with 10ms PRACH periodicity, and other detailed configuration defined in table 6.3.3.2-4 in TS 38.211 [6].	
msg1-SubcarrierSpacing	Same as UL carrier SCS		
totalNumberOfRA-Preambles	48	Total number of preambles used for contention based and contention free random access	
numberOfRA-PreamblesGroupA	48	No group B.	
prach-RootSequenceIndex	0	Logic sequence index = 0, resulting in root sequence = 1.	
ssb-perRACH-Occasion	oneFourth	OneFourth: 1 SSB associated with 4 RACH occasions	
msg1-FDM	One	One PRACH transmission occasions FDMed in one time instance.	
powerRampingStep	dB2		
preambleReceivedTargetPower	dBm-120		
preambleTransMax	n6	Max number of RA preamble transmission performed before declaring a failure is 6	
ra-ResponseWindow	sl10	10 slots	
zeroCorrelationZoneConfig	11	N-CS configuration, N <sub>CS</sub> = 23	
Backoff Parameter Index	2	20 ms, as defined in table 7.2-1 in TS 38.321 [7].	
ssb-ResourceList	ra-PreambleIndex = 50	Associated with SSB index 0. UE doesn't use ssb-ResourceList and BFR-SSB-Resource IEs at the same time. UE doesn't use this field if is transmitting CFRA to convey BFR.	
BFR-SSB-Resource	ra-PreambleIndex = 50	Associated with SSB index 0. UE doesn't use ssb-ResourceList and BFR-SSB-Resource IEs at the same time. UE uses this field only if is transmitting CFRA to convey BFR	
ra-ssb-OccasionMaskIndex	1	PRACH occasion index 1 is allowed	
rsrp-ThresholdSSB	RSRP_51	The actual value of the threshold is - 105dBm, as defined in TS 38.331 [2].	
Note: For further information see clause 6.3.2 in TS 38.331 [2].			

# A.3.8.3.3 FR2 PRACH configuration 3

FR2 PRACH configuration 3 in this clause provides the typical PRACH configuration for CSI-RS based non-contention based random access in FR2.

Field	Value	Comment
prach-ConfigurationIndex	190	Preamble Format C2, with 10ms PRACH
		periodicity, and other detailed configuration
		defined in table 6.3.3.2-4 in TS 38.211 [6].
msg1-SubcarrierSpacing	Same as UL carrier SCS	
totalNumberOfRA-Preambles	48	Total number of preambles used for
		contention based and contention free
		random acces
numberOfRA-PreamblesGroupA	48	No group B.
prach-RootSequenceIndex	0	Logic sequence index = 0, resulting in root
		sequence = 1.
ssb-perRACH-Occasion	oneFourth	OneFourth: 1 SSB associated with 4 RACH
		occasions
msg1-FDM	One	One PRACH transmission occasions
		FDMed in one time instance.
powerRampingStep	dB2	
preambleReceivedTargetPower	dBm-120	
preambleTransMax	n6	Max number of RA preamble transmission
		performed before declaring a failure is 6
ra-ResponseWindow	sl10	10 slots
zeroCorrelationZoneConfig	11	N-CS configuration, N <sub>CS</sub> = 23
Backoff Parameter Index	2	20 ms, as defined in table 7.2-1 in TS
		38.321 [7].
csirs-ResourceList	ra-PreambleIndex = 50	Associated with CSI-RS configured
ra-OccasionList	1	RA occasions allowed corresponding to
		CSI-RS
rsrp-ThresholdCSI-RS	RSRP_51	The actual value of the threshold is -
		105dBm, as defined in TS 38.331 [2].
Note: For further information se	ee clause 6.3.2 in TS 38.331 [2	].

## A.3.8.3.4 FR2 PRACH configuration 4

FR2 PRACH configuration 4 in this clause provides the PRACH configuration for CSI-RS based non-contention based random access in FR2 to convey BFR.

Field	Value	Comment
prach-ConfigurationIndex	190	Preamble Format C2, with 10ms PRACH
		periodicity, and other detailed configuration
		defined in table 6.3.3.2-4 in TS 38.211 [6].
msg1-SubcarrierSpacing	Same as UL carrier SCS	
totalNumberOfRA-Preambles	48	Total number of preambles used for
		contention based and contention free
		random access
numberOfRA-PreamblesGroupA	48	No group B.
prach-RootSequenceIndex	0	Logic sequence index = 0, resulting in root
		sequence = 1.
ssb-perRACH-Occasion	oneFourth	OneFourth: 1 SSB associated with 4 RACH
		occasions
msg1-FDM	One	One PRACH transmission occasions
		FDMed in one time instance.
powerRampingStep	dB2	
preambleReceivedTargetPower	dBm-120	
preambleTransMax	n200	Max number of RA preamble transmission
		performed before declaring a failure is 200.
ra-ResponseWindow	sl40	40 slots
zeroCorrelationZoneConfig	11	N-CS configuration, N <sub>CS</sub> = 23
Backoff Parameter Index	2	20 ms, as defined in table 7.2-1 in TS
		38.321 [7].
BFR-CSIRS-Resource	ra-PreambleIndex = 50	Associated with CSI-RS configured
ra-OccasionList	1	RA occasions allowed corresponding to
		CSI-RS
rsrp-ThresholdSSB	RSRP_51	The actual value of the threshold is -
		105dBm, as defined in TS 38.331 [2].
Note: For further information se	ee clause 6.3.2 in TS 38.331 [2	].

# A.3.9 BWP configurations

### A.3.9.1 Introduction

This clause provides the typical BWP configurations used for RRM test cases defined in Annex A. For downlink BWP, both initial BWP and dedicated BWP configurations are specified in clause A.3.9.2 and for uplink BWP, both initial BWP and dedicated BWP configurations are specified in clause A.3.9.3. To note that for other parameters not listed in this clause, either it can be derived from the set up of each test or it is subjected to RAN5 specifications.

# A.3.9.2 Downlink BWP configurations

### A.3.9.2.1 Initial BWP

Table A.3.9.2.1-1: Downlink BWP patterns for initial BWP configuration

BWP Parameters	Unit		Values	
Reference BWP		DLBWP.0.1	DLBWP.0.2	
Starting PRB index		0	RB <sub>a</sub> Note 1	
Bandwidth	RB	Same as RF channel defined in each test	same as RMSI CORESET (CORESET #0) defined in each test	
Note 1: RB <sub>a</sub> is the I	owest PRB index to guarantee the BWP including SSB PRB index			
(RB., RB.)+1 RB.)+19) which is defined in Clause A.3.10.				

### A.3.9.2.2 Dedicated BWP

Table A.3.9.2.2-1: Downlink BWP patterns for dedicated BWP configuration

BWP Parameters	Unit		Values		
Reference BWP		DLBWP.1.1	DLBWP.1.2	DLBWP.1.3	
Starting PRB index		0	RB <sub>b</sub> Note 1	RB <sub>a</sub> Note 2	
Bandwidth	RB	Same as RF	25 for SCS =	25 for SCS =	
		channel defined	15KHz,	15KHz,	
		in each test	51 for SCS =	51 for SCS =	
			30KHz,	30KHz,	
			32 for SCS =	32 for SCS =	
			120KHz	120KHz	
Note 1: RBb is the	lowest F	PRB index to guarantee the BWP not fully overlapped with SSB			
PRB index	k (RBJ, F	RBJ+1,, RBJ+19) which is defined in Clause A.3.10.			
Note 2: RBa is the	lowest F	PRB index to guarantee the BWP including SSB PRB index			
(RB <sub>J</sub> , RB <sub>J</sub>	+1,, RI	B <sub>J+19</sub> ) which is define	<sub>U+19</sub> ) which is defined in Clause A.3.10.		

# A.3.9.3 Uplink BWP configurations

### A.3.9.3.1 Initial BWP

Table A.3.9.3.1-1: Uplink BWP patterns for initial BWP configuration

BWP Parameters	Unit		Values	
Reference BWP		ULBWP.0.1	ULBWP.0.2	
Starting PRB index		0	RB <sub>a</sub> Note 1	
Bandwidth	RB	Same as RF channel defined in each test	same as RMSI CORESET (CORESET #0) defined in each test	
Note 1: RBa is the lowest PRB index to guarantee the BWP including SSB PRB index				
(RB <sub>I</sub> , RB <sub>I</sub> +1, RB <sub>I</sub> +19) which is defined in Clause A.3.10.				

### A.3.9.3.2 Dedicated BWP

Table A.3.9.3.2-1: Uplink BWP patterns for dedicated BWP configuration

BWP Parameters	Unit		Values	
Reference BWP		ULBWP.1.1	ULBWP.1.2	ULBWP.1.3
Starting PRB index		0	RB <sub>b</sub> Note 1	RBa Note 2
Bandwidth	RB	Same as RF channel defined in each test	25 for SCS = 15KHz, 51 for SCS = 30KHz, 32 for SCS = 120KHz	25 for SCS = 15KHz, 51 for SCS = 30KHz, 32 for SCS = 120KHz
	the lowest PRB index to guarantee the BWP not fully overlapped with SSB			
		RB <sub>J+1</sub> ,, RB <sub>J+19</sub> ) which is defined in Clause A.3.10.		
		PRB index to guarantee the BWP including SSB PRB index		
(RB <sub>J</sub> , RB <sub>J</sub>	+1,, RI	<sub>J+19</sub> ) which is defined in Clause A.3.10.		

# A.3.10 SSB Configurations

# A.3.10.1 SSB Configurations for FR1

A.3.10.1.1 SSB pattern 1 in FR1: SSB allocation for SSB SCS=15 kHz in 10 MHz

Table A.3.10.1.1-1: SSB.1 FR1: SSB Pattern 1 for SSB SCS=15 kHz in 10 MHz channel

SSB Parameters	Values	
Channel bandwidth	10 MHz	
SSB SCS	15 kHz	
SSB periodicity (T <sub>SSB</sub> )	20 ms	
Number of SSBs per SS-burst	1	
SS/PBCH block index	0	
Symbol numbers containing SSB Note 2	2-5	
Slot numbers containing SSB Note 2 0		
SFN containing SSB	SFN mod $(max(T_{SSB}, 10ms)/10ms) = 0$	
RB numbers containing SSB within channel BW (RBJ, RBJ+1,, RBJ+19) <sup>Note 1</sup>		
Note 1: RBs containing SSB can be configured	in any frequency location within the cell	
bandwidth according to the allowed synchronization raster defined in TS		
38.104 [13].		
Note 2: These values have been derived from other parameters for information		
purposes (as per TS 38.213 [3]). They	are not settable parameters themselves.	

## A.3.10.1.2 SSB pattern 2 in FR1: SSB allocation for SSB SCS=30 kHz in 40 MHz

Table A.3.10.1.2-1: SSB.2 FR1: SSB Pattern 2 for SSB SCS=30 kHz in 40 MHz channel

	SSB Parameters	Values
Channel	bandwidth	40 MHz
SSB SCS	3	30 kHz
SSB peri	odicity (T <sub>SSB</sub> )	20 ms
Number	of SSBs per SS-burst	1
	H block index	0
Symbol r	numbers containing SSB Note 3	4-7 or 2-5 Note 2
	bers containing SSB Note 3	0
SFN containing SSB SFN mod (max(T <sub>SSB</sub> ,10ms)/10ms) =		SFN mod $(max(T_{SSB}, 10ms)/10ms) = 0$
RB numbers containing SSB within channel BW (RBJ, RBJ+1,, RBJ+19)Note 1		(RB <sub>J</sub> , RB <sub>J+1</sub> ,, RB <sub>J+19</sub> ) <sup>Note 1</sup>
Note 1: RBs containing SSB can be configured in any frequency location within the ce bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].		
Note 2: Symbols 4-7 is chosen, if the SSB pattern Case B should be used for the currer band as indicated by Table 5.4.3.3-1 of TS 38.104 [13]; Otherwise, symbol 2-5 chosen.		
Note 3: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves.		

### A.3.10.1.3 SSB pattern 3 in FR1: SSB allocation for SSB SCS=15 kHz in 10 MHz

Table A.3.10.1.3-1: SSB.3 FR1: SSB Pattern 3 for SSB SCS=15 kHz in 10 MHz channel

SSB Parameters	Values	
Channel bandwidth	10 MHz	
SSB SCS	15 kHz	
SSB periodicity (T <sub>SSB</sub> )	20 ms	
Number of SSBs per SS-burst	2	
SS/PBCH block index	0 1	
Symbol numbers containing SSB Note 2	2-5 8-11	
Slot numbers containing SSB Note 2	0 0	
SFN containing SSB	SFN mod $(max(T_{SSB}, 10ms)/10ms) = 0$	
RB numbers containing SSB within channel B	W (RBJ, RBJ+1,, RBJ+19) <sup>Note 1</sup>	
Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].		
Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselve		

## A.3.10.1.4 SSB pattern 4 in FR1: SSB allocation for SSB SCS=30 kHz in 40 MHz

Table A.3.10.1.4-1: SSB.4 FR1: SSB Pattern 4 for SSB SCS=30 kHz in 40 MHz channel

	SSB Parameters	Val	ues
Channel	bandwidth	40 MHz	
SSB SCS	3	30 kHz	
SSB peri	odicity (T <sub>SSB</sub> )	20 ms	
Number	of SSBs per SS-burst	2	
SS/PBCI	H block index	0	1
Symbol r	numbers containing SSB Note 3	4-7 or 2-5 Note 2	8-11
	bers containing SSB Note 3	0	0
SFN con	taining SSB	SFN mod (max(Tss	3,10ms)/10ms) = 0
RB numb	pers containing SSB within channel BW	3W (RBJ, RBJ+1,, RBJ+19)Note 1	
Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].			
Note 2: Symbols 4-7 is chosen, if the SSB pattern Case B should be used for the current band as indicated by Table 5.4.3.3-1 of TS 38.104 [13]; Otherwise, symbol 2-5 is chosen.			
Note 3: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves.			

# A.3.10.1.5 SSB pattern 5 in FR1: SSB allocation for SSB SCS=15 kHz starting from odd SFN in 10 MHz

Table A.3.10.1.5-1: SSB.5 FR1: SSB Pattern 5 for SSB SCS=15 kHz in 10 MHz channel

SSB Parameters	Values	
Channel bandwidth	10 MHz	
SSB SCS	15 kHz	
SSB periodicity (T <sub>SSB</sub> )	20 ms	
Number of SSBs per SS-burst	1	
SS/PBCH block index	0	
Symbol numbers containing SSB Note 2 2-5		
Slot numbers containing SSB Note 2 0		
SFN containing SSB SFN mod (max(T <sub>SSB</sub> ,10ms)/10ms) =		
RB numbers containing SSB within channel BW (RBJ, RBJ+1,, RBJ+19) <sup>Note 1</sup>		
Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS		
38.104 [13].		
Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves.		

# A.3.10.1.6 SSB pattern 6 in FR1: SSB allocation for SSB SCS=30 kHz starting from odd SFN in 40 MHz

Table A.3.10.1.6-1: SSB.6 FR1: SSB Pattern 6 for SSB SCS=30 kHz in 40 MHz channel

SSB Parameters Values		Values	
Channel	bandwidth	40 MHz	
SSB SCS	3	30 kHz	
SSB perio	odicity (T <sub>SSB</sub> )	20 ms	
Number of	of SSBs per SS-burst	1	
	l block index	0	
Symbol n	umbers containing SSB Note 3	4-7 or 2-5 Note 2	
Slot num	bers containing SSB Note 3	0	
SFN conf	SFN containing SSB SFN mod $(max(T_{SSB}, 10ms)/10ms) = 1$		
RB numb	RB numbers containing SSB within channel BW (RBJ, RBJ+1,, RBJ+19)Note 1		
Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].			
Note 2:	Note 2: Symbols 4-7 is chosen, if the SSB pattern Case B should be used for the current band as indicated by Table 5.4.3.3-1 of TS 38.104 [13]; Otherwise, symbol 2-5 is chosen.		
Note 3: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves.			

# A.3.10.2 SSB Configurations for FR2

A.3.10.2.1 SSB pattern 1 in FR2: SSB allocation for SSB SCS=120 kHz in 100 MHz

Table A.3.10.2.1-1: SSB.1 FR2: SSB Pattern 1 for SSB SCS = 120 kHz in 100 MHz channel with 2 SSBs per SS-burst

	SSB Parameters	Val	ues	
Channel	bandwidth	100 MHz		
SSB SCS	5	120 kHz		
SSB peri	odicity (Tssb)	20 ms		
Number of	of SSBs per SS-burst	2		
SS/PBCF	H block index	0 1		
	numbers containing SSBs Note 2	4-7 8-11		
Slot num	bers containing SSB Note 2	0 0		
SFN conf	taining SSB	SFN mod (max(T <sub>SSB</sub> ,10ms)/10ms) = 0		
RB numb	pers containing SSBs within channel BW			
Note 1: RBs containing SSB can be configured in any frequency location within the cell				
	bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].			
Note 2:	Note 2: These values have been derived from other parameters for information purposes (as			
per TS 38.213 [3]). They are not settable parameters themselves.				

### A.3.10.2.2 SSB pattern 2 in FR2: SSB allocation for SSB SCS=240 kHz in 100 MHz

Table A.3.10.2.2-1: SSB.2 FR2: SSB Pattern 2 for SSB SCS = 240 kHz in 100 MHz channel with 2 SSBs per SS-burst

	SSB Parameters		Values	
Channel	bandwidth	100 MHz		
SSB SCS	S	240 kHz		
SSB peri	odicity (Tssb)	20 ms		
Number of	of SSBs per SS-burst	2		
SS/PBCH	l block index	0	1	
	numbers containing SSBs Note 2	8-11 12-13 0-1		0-1
Slot num	bers containing SSB Note 2	0 0 1		1
SFN conf	taining SSB	SFN mod (max(T <sub>SSB</sub> ,10ms)/10ms) = 0		
RB numb	RB numbers containing SSBs within channel BW (RBJ, RBJ+1,, RBJ+19) <sup>Note 1</sup>			
Note 1: RBs containing SSB can be configured in any frequency location within the cell				
bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].			S 38.104 [13].	
Note 2: These values have been derived from other parameters for information purposes (as			purposes (as	
per TS 38.213 [3]). They are not settable parameters themselves.				

## A.3.10.2.3 SSB pattern 3 in FR2: SSB allocation for SSB SCS=120 kHz in 100 MHz

Table A.3.10.2.3-1: SSB.3 FR2: SSB Pattern 3 for SSB SCS = 120 kHz in 100 MHz channel with 1 SSB per SS-burst

SSB Parameters	Values	
Channel bandwidth	100 MHz	
SSB SCS	120 kHz	
SSB periodicity (T <sub>SSB</sub> )	20 ms	
Number of SSBs per SS-burst	1	
SS/PBCH block index	0	
Symbol numbers containing SSBs Note 2	4-7	
Slot numbers containing SSB Note 2	0	
SFN containing SSB	SFN mod $(max(T_{SSB}, 10ms)/10ms) = 0$	
RB numbers containing SSBs within channel BW	W (RBJ, RBJ+1,, RBJ+19)Note 1	
Note 1: RBs containing SSB can be configured in any frequency location within the cell		

bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].

Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves.

### A.3.10.2.4 SSB pattern 4 in FR2: SSB allocation for SSB SCS=240 kHz in 100 MHz

Table A.3.10.2.4-1: SSB.4 FR2: SSB Pattern 4 for SSB SCS = 240 kHz in 100 MHz channel with 1 SSB per SS-burst

SSB Parameters	Values	
Channel bandwidth	100 MHz	
SSB SCS	240 kHz	
SSB periodicity (T <sub>SSB</sub> )	20 ms	
Number of SSBs per SS-burst	1	
SS/PBCH block index	0	
Symbol numbers containing SSBs Note 2	8-11	
Slot numbers containing SSB Note 2	0	
SFN containing SSB	SFN mod $(max(T_{SSB}, 10ms)/10ms) = 0$	
RB numbers containing SSBs within channel BW	within channel BW (RB <sub>J</sub> , RB <sub>J+1</sub> ,, RB <sub>J+19</sub> ) <sup>Note 1</sup>	
Note 1: RBs containing SSB can be configured in any frequency location within the cell		
bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].		
Note 2: These values have been derived from other parameters for information purposes (as		
per TS 38.213 [3]). They are not settable parameters themselves.		

### A.3.10.2.5 SSB pattern 5 in FR2: SSB allocation for SSB SCS=120 kHz in 100 MHz

Table A.3.10.2.5-1: SSB.5 FR2: SSB Pattern 5 for SSB SCS = 120 kHz in 100 MHz channel with 2 SSBs per SS-burst

SSB Parameters	Values	
Channel bandwidth	100 MHz	
SSB SCS	120 kHz	
SSB periodicity (T <sub>SSB</sub> )	20 ms	
Number of SSBs per SS-burst	2	
SS/PBCH block index	2	3
Symbol numbers containing SSBs Note 2	2-5	6-9
Slot numbers containing SSB Note 2	1	1
SFN containing SSB	SFN mod $(max(T_{SSB}, 10ms)/10ms) = 0$	
RB numbers containing SSBs within channel BW	/ (RBJ, RBJ+1,, RBJ+19) <sup>Note 1</sup>	
Note 1: RBs containing SSB can be configured in any frequency location within the cell		

bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].

Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves.

### A.3.10.2.6 SSB pattern 6 in FR2: SSB allocation for SSB SCS=240 kHz in 100 MHz

Table A.3.10.2.6-1: SSB.6 FR2: SSB Pattern 6 for SSB SCS = 240 kHz in 100 MHz channel with 2 SSBs per SS-burst

SSB Parameters	Valu	ies
Channel bandwidth	100 MHz	
SSB SCS	240 kHz	
SSB periodicity (T <sub>SSB</sub> )	20 ms	
Number of SSBs per SS-burst	2	
SS/PBCH block index	2	3
Symbol numbers containing SSBs Note 2	2-5	6-9
Slot numbers containing SSB Note 2	1	1
SFN containing SSB	SFN mod (max(Tssb,1	10ms)/10ms) = 0
RB numbers containing SSBs within channel BW	(RBJ, RBJ+1,, RBJ+1	9)Note 1

Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].

Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves.

### A.3.10.2.7 SSB pattern 7 in FR2: SSB allocation for SSB SCS=120 kHz in 100 MHz

Table A.3.10.2.7-1: SSB.7 FR2: SSB Pattern 7 for SSB SCS = 120 kHz in 100 MHz channel with 1 SSB per SS-burst

SSB Parameters	Values		
Channel bandwidth	100 MHz		
SSB SCS	120 kHz		
SSB periodicity (T <sub>SSB</sub> )	20 ms		
Number of SSBs per SS-burst	1		
SS/PBCH block index	1		
Symbol numbers containing SSBs Note 2	8-11		
Slot numbers containing SSB Note 2	0		
SFN containing SSB	SFN mod (max( $T_{SSB}$ ,10ms)/10ms) = 0		
RB numbers containing SSBs within channel BW	PI BW (RBJ, RBJ+1,, RBJ+19)Note 1		
Note 1: RBs containing SSB can be configured in any frequency location within the cell			

bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].

Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves.

### A.3.10.2.8 SSB pattern 8 in FR2: SSB allocation for SSB SCS=240 kHz in 100 MHz

Table A.3.10.2.8-1: SSB.8 FR2: SSB Pattern 8 for SSB SCS = 240 kHz in 100 MHz channel with 1 SSB per SS-burst

SSB Parameters	Val	ues
Channel bandwidth	100 MHz	
SSB SCS	240 kHz	
SSB periodicity (T <sub>SSB</sub> )	20 ms	
Number of SSBs per SS-burst	1	
SS/PBCH block index	1	
Symbol numbers containing SSBs Note 2	12-13 0-1	
Slot numbers containing SSB Note 2	0 1	
SFN containing SSB	SFN mod (max(T <sub>SSB</sub> ,10ms)/10ms) = 0	
RB numbers containing SSBs within channel BW (RBJ, RBJ+1,, RBJ+19) <sup>Note 1</sup>		
Note 1: RBs containing SSB can be configured in any frequency location within the cell		
bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].		
Note 2: These values have been derived from other parameters for information purposes (as		

# A.3.11 SMTC Configurations

# A.3.11.1 SMTC pattern 1: SMTC period = 20 ms with SMTC duration = 1 ms

per TS 38.213 [3]). They are not settable parameters themselves.

Table A.3.11.1-1: SMTC.1: SMTC Pattern 1 for SMTC period = 20 ms and duration = 1 ms

SMTC Parameters	Values
SMTC periodicity	20 ms
SMTC offset	0 ms
SMTC duration	1 ms

# A.3.11.2 SMTC pattern 2: SMTC period = 20 ms with SMTC duration = 5 ms

Table A.3.11.2-1: SMTC.2: SMTC Pattern 2 for SMTC period = 20 ms and duration = 5 ms

SMTC Parameters	Values
SMTC periodicity	20 ms
SMTC offset	0 ms
SMTC duration	5 ms

# A.3.11.3 SMTC pattern 3: SMTC period = 160 ms with SMTC duration = 1 ms

Table A.3.11.3-1: SMTC.3: SMTC Pattern 3 for SMTC period = 20 ms and duration = 5 ms

SMTC Parameters	Values
SMTC periodicity	160 ms
SMTC offset	0 ms
SMTC duration	1 ms

# A.3.11.4 SMTC pattern 4: SMTC period = 20 ms with SMTC duration = 1 ms

Table A.3.11.4-1: SMTC.4: SMTC Pattern 4 for SMTC period = 20 ms and duration = 1 ms

SMTC Parameters	Values
SMTC periodicity	20 ms
SMTC offset	10 ms
SMTC duration	1 ms

# A.3.11.5 SMTC pattern 5: SMTC period = 20 ms with SMTC duration = 5 ms

Table A.3.11.4-1: SMTC.5: SMTC Pattern 5 for SMTC period = 20 ms and duration = 5 ms

SMTC Parameters	Values
SMTC periodicity	20 ms
SMTC offset	10 ms
SMTC duration	5 ms

# A.3.12 Test Cases with Different CC Configurations

# A.3.12.1 EN-DC Test Cases with Different EN-DC Configurations

#### A.3.12.1.1 Introduction

In Annex A EN-DC test cases may be defined for two component carriers (CCs) as well as for more than two CCs to verify the same RRM requirement.

### A.3.12.1.2 Principle of testing

If multiple EN-DC test cases are defined for two CCs as well as for more than two CCs to verify the same type of RRM requirement, which depends on the number of CCs, then from the UE performance point of view the test coverage can be considered fulfilled by executing only the EN-DC test cases with the maximum number of CCs in EN-DC supported by the UE. Otherwise if the same type of RRM requirement is independent of the number of CCs then from the UE performance point of view the test coverage can be considered fulfilled by executing only the EN-DC test cases with two CCs in EN-DC supported by the UE.

Editor's: The maximum number of CCs that can be used in FR2 tests in EN-DC would depend on the test equipment capability.

## A.3.12.2 Carrier Aggregation Test Cases with Different CA Configurations

#### A.3.12.2.1 Introduction

In Annex A carrier aggregation test cases may be defined for two CCs as well as for more than two CCs to verify the same RRM requirement.

### A.3.12.2.2 Principle of testing

If multiple carrier aggregation test cases are defined for two CCs as well as for more than two CCs to verify the same RRM requirement, which depends on the number of CCs, then from the UE performance point of view the test coverage can be considered fulfilled by executing only the CA test cases with the maximum number of CCs in CA supported by the UE. Otherwise if the same type of RRM requirement is independent of the number of CCs then from the UE performance point of view the test coverage can be considered fulfilled by executing only the CA test cases with at least two CCs in CA supported by the UE.

Editor's: The maximum number of CCs that can be used in FR2 tests in CA would depend on the test equipment capability.

# A.3.13 Test Cases in SA and EN-DC Operations

#### A.3.13.1 Introduction

This clause defines a principle which is applicable to test cases verifying RRM requirements in standalone (SA) or EN-DC operations.

In Annex A test cases may be defined in SA and EN-DC operations to verify the same RRM requirement.

Editor's note: this clause may need to define further for NE-DC and NR-DC test cases, which subjects to the test cases defined in the future.

# A.3.13.2 Principle of Testing

If test cases are defined in both SA and EN-DC operations to verify the same RRM requirement then the UE capable of both SA and EN-DC operations needs to verify that RRM requirement by performing test case(s) in either SA operation or in EN-DC operation.

If test cases are defined in both SA and EN-DC operations to verify at least one common RRM requirement then the UE capable of both SA and EN-DC operations needs to verify RRM requirements by performing test case(s) in either SA operation or in EN-DC operation provided that the performed test case(s):

- verifies the largest number of RRM requirements and
- verifies at least all RRM requirements covered in the test case(s), which is not performed.

# A.3.14 CSI-RS configurations

## A.3.14.1 FDD

Table A.3.14.1-1: CSI-RS Reference Measurement Channels for SCS=15kHz

	CSI-RS.1.1 FDD	CSI-RS.1.2 FDD	CSI-RS.1.3 FDD	CSI-RS.1.4 FDD
Resource Type Resource Set Config	periodic	periodic	aperiodic	aperiodic
	0	0	0	0
nzp-CSI-ResourceSetId	0	0 off	0 off	-
repetition	n.a.			on
aperiodicTriggeringOffset	n.a.	n.a.	6	6
trs-Info  Resource Config	n.a.	n.a.	n.a.	n.a.
	0 for recourse #0	10 for resource #0	20 for resource #0	30 for resource #0 31 for resource #1 32 for resource #2 33 for resource #3
nzp-CSI-RS-ResourceId	0 for resource #0	11 for resource #1	21 for resource #1	34 for resource #4 35 for resource #5 36 for resource #6 37 for resource #7
powerControlOffset	0	0	0	0
powerControlOffsetSS	db0	db0	db0	db0
scramblingID	0	0	0	0
Period (slots)	slot5	slot10	n.a.	n.a.
Offset	1	1	n.a.	n.a.
qcl-InfoPeriodicCSI-RS	TCI.State.0	TCI.State.0 TCI.State.1	n.a.	n.a.
frequencyDomainAllocation	000001	000001	000001	000001
nrofPorts	2	1	1	1
firstOFDMSymbolInTimeDomain	5 for resource #0	6 for resource #0	6 for resource #0	0 for resource #0 1 for resource #1 2 for resource #2 3 for resource #3
inicial sweymbolii i inicialii	5 for resource #0	10 for resource #1	10 for resource #1	4 for resource #4 5 for resource #5 6 for resource #6 7 for resource #7
cdm-Type	FD-CDM2	noCDM	noCDM	noCDM
density	1	3	3	3
startingRB	0	0	0	0

nrofRBs	276	276	276	276

## A.3.14.2 TDD

Table A.3.14.2-1: CSI-RS Reference Measurement Channels for SCS=15kHz

	CSI-RS.1.1 TDD	CSI-RS.1.2 TDD	CSI-RS.1.3 TDD	CSI-RS.1.4 TDD
Resource Type	periodic	periodic	aperiodic	aperiodic
Resource Set Config				
nzp-CSI-ResourceSetId	0	0	0	0
repetition	n.a.	off	off	on
aperiodicTriggeringOffset	n.a.	n.a.	6	6
trs-Info	n.a.	n.a.	n.a.	n.a.
Resource Config				
		10 for resource #0	20 for resource #0	30 for resource #0 31 for resource #1 32 for resource #2
nzp-CSI-RS-Resourceld	0 for resource #0			33 for resource #3 34 for
Tizp correct resourced		11 for resource #1	21 for resource #1	resource #4 35 for resource #5 36 for resource #6 37 for resource #7
powerControlOffset	0	0	0	0
powerControlOffsetSS	db0	db0	db0	db0
scramblingID	0	0	0	0
Period (slots)	slot5	slot10	n.a.	n.a.
Offset	1	1	n.a.	n.a.
qcl-InfoPeriodicCSI-RS	TCI.State.0	TCI.State.0 TCI.State.1	n.a.	n.a.
frequencyDomainAllocation	000001	000001	000001	000001
nrofPorts	2	1	1	1
firstOFDMSymbolInTimeDomain	5 for resource #0	6 for resource #0	6 for resource #0	0 for resource #0 1 for resource #1 2 for resource
				#2 3 for resource #3
		10 for resource #1	10 for resource #1	4 for resource #4 5 for resource #5 6 for resource #6 7 for resource #7

cdm-Type	FD-CDM2	noCDM	noCDM	noCDM
density	1	3	3	3
startingRB	0	0	0	0
nrofRBs	276	276	276	276

Table A.3.14.2-2: CSI-RS Reference Measurement Channels for SCS=30kHz

	CSI-RS.2.1 TDD	CSI-RS.2.2 TDD	CSI-RS.2.3 TDD	CSI-RS.2.4 TDD
Resource Type	periodic	periodic	aperiodic	aperiodic
Resource Set Config				
nzp-CSI-ResourceSetId	0	0	0	0
repetition	n.a.	off	off	on
aperiodicTriggeringOffset	n.a.	n.a.	6	6
trs-Info	n.a.	n.a.	n.a.	n.a.
Resource Config				
nzp-CSI-RS-ResourceId	0 for resource #0	10 for resource #0	20 for resource #0	30 for resource #0 31 for resource #1 32 for resource #2 33 for resource #3
	U for resource #U	11 for resource #1	21 for resource #1	34 for resource #4 35 for resource #5 36 for resource #6 37 for resource #7
powerControlOffset	0	0	0	0
powerControlOffsetSS	db0	db0	db0	db0
scramblingID	0	0	0	0
Period (slots)	slot10	slot20	n.a.	n.a.
Offset	2	2	n.a.	n.a.
qcl-InfoPeriodicCSI-RS	TCI.State.0	TCI.State.0 TCI.State.1	n.a.	n.a.
frequencyDomainAllocation	000001	000001	000001	000001
nrofPorts	2	1	1	1
firetOEDMSvmballnTimaDamain	5 for resource #0	6 for resource #0	6 for resource #0	0 for resource #0 1 for resource #1 2 for resource #2 3 for resource #3
firstOFDMSymbolInTimeDomain	3 for resource #0	10 for resource #1	10 for resource #1	4 for resource #4 5 for resource #5 6 for resource #6 7 for resource #7

cdm-Type	FD-CDM2	noCDM	noCDM	noCDM
density	1	3	3	3
startingRB	0	0	0	0
nrofRBs	276	276	276	276

Table A.3.14.2-3: CSI-RS Reference Measurement Channels for SCS=120kHz

	CSI-RS.3.1 TDD	CSI-RS.3.2 TDD	CSI-RS.3.3 TDD	CSI-RS.3.4 TDD
Resource Type	periodic	periodic	aperiodic	aperiodic
Resource Set Config				
nzp-CSI-ResourceSetId	0	0	0	0
repetition	n.a.	off	off	on
aperiodicTriggeringOffset	n.a.	n.a.	6	6
trs-Info	n.a.	n.a.	n.a.	n.a.
Resource Config				
nzp-CSI-RS-ResourceId	0 for resource #0	10 for resource #0	20 for resource #0	30 for resource #0 31 for resource #1 32 for resource #2 33 for resource #3
	U for resource #U	11 for resource #1	21 for resource #1	34 for resource #4 35 for resource #5 36 for resource #6 37 for resource #7
powerControlOffset	0	0	0	0
powerControlOffsetSS	db0	db0	db0	db0
scramblingID	0	0	0	0
Period (slots)	slot40	slot80	n.a.	n.a.
Offset	8	8	n.a.	n.a.
qcl-InfoPeriodicCSI-RS	TCI.State.0	TCI.State.0 TCI.State.1	n.a.	n.a.
frequencyDomainAllocation	000001	000001	000001	000001
nrofPorts	2	1	1	1
firetOEDMSvmballnTimaDamain	5 for resource #0	6 for resource #0	6 for resource #0	0 for resource #0 1 for resource #1 2 for resource #2 3 for resource #3
firstOFDMSymbolInTimeDomain	3 for resource #0	10 for resource #1	10 for resource #1	4 for resource #4 5 for resource #5 6 for resource #6 7 for resource #7

cdm-Type	FD-CDM2	noCDM	noCDM	noCDM
density	1	3	3	3
startingRB	0	0	0	0
nrofRBs	276	276	276	276

# A.3.15 Angle of Arrival (AoA) for FR2 RRM test cases

This clause specifies the AoA setups for FR2 RRM test cases in clause A.5 and A.7. The applicable AoA setup is defined in each test case in clause A.5 and A.7.

### A.3.15.1 Setup 1: Single AoA in Rx beam peak direction

There is only one active probe in the test. The DL signals, and noise if applicable, transmitted from the probe, are aligned to the UE Rx beam peak direction (as defined in TS 38.101-2 [19]).

## A.3.15.2 Setup 2: Single AoA in non Rx beam peak direction

# A.3.15.2.1 Setup 2a: Single AoA in non Rx beam peak direction without change in direction

There is only one active probe in the test. The DL signals, and noise if applicable, transmitted from the probe, align to a direction (AoA) which is from the set of directions corresponding to the EIS spherical coverage percentile of the DUT as defined in clause 7.3.4 of TS 38.101-2 [19] for each UE power class. The direction (AoA) of the signals shall not be changed between test iterations.

# A.3.15.2.2 Setup 2b: Single AoA in non Rx beam peak direction with change in direction

There is only one active probe in the test. The DL signals, and noise if applicable, transmitted from the probe, align to a direction (AoA) which is from the set of directions corresponding to the EIS spherical coverage percentile of the DUT as defined in clause 7.3.4 of TS 38.101-2 [19] for each UE power class. For UE power class 3, the direction (AoA) of the signals shall be changed for each test iteration (for UE power classes other than 3, this is FFS).

# A.3.15.3 Setup 3: 2 AoAs

There are 2 active probes in the test. The DL signals, and noise if applicable, transmitted from the two active probes, align to directions (AoAs) which are from the set of directions corresponding to the EIS spherical coverage percentile of the DUT as defined in clause 7.3.4 of TS 38.101-2 [19] for each UE power class. The relative angular offset between the directions (AoAs) of the 2 active probes, shall be changed for each test iteration. The applicable set of relative angular offsets between the 2 active probes is given in Table 3.15.3-1 for each UE power class.

Editor Note: If RAN5 finds the changing of angular offset between the directions (AoAs) of the 2 active probes per test iteration to be infeasible from the perspectives of EIS spherical coverage and other impacts, e.g.: testing time, then the test setup will be revised.

Table 3.15.3-1: Set of relative angular offsets between active probes for each power class

UE Power class	Relative angular offset between active probes		
1	FFS		
2	FFS		
3	30°, 60°, 90°, 120° and 150°		
4	FFS		

# A.3.15.4 Setup 4: 2 AoAs, 1 AoA in Rx beam peak direction, 1 in non Rx beam peak

# A.3.15.4.1 Setup 4a: 2 AoAs, 1 AoA in Rx beam peak direction, 1 in non Rx beam peak without change in direction

There are 2 active probes in the test. The DL signals, and noise if applicable, are transmitted from the two active probes. One probe is aligned to the UE Rx beam peak direction as defined in TS 38.101-2 [19]. The second is aligned to a direction (AoA) which is from the set of directions corresponding to the EIS spherical coverage percentile of the DUT as defined in clause 7.3.4 of TS 38.101-2 [19] for each UE power class. The direction (AoA) of the non Rx beam peak signal shall not be changed between test iterations.

# A.3.15.4.2 Setup 4b: 2 AoAs, 1 AoA in Rx beam peak direction, 1 in non Rx beam peak with change in direction

There are 2 active probes in the test. The DL signals, and noise if applicable, are transmitted from the two active probes. One probe is aligned to the UE Rx beam peak direction as defined in TS 38.101-2 [19]. The second is aligned to a direction (AoA) which is from the set of directions corresponding to the EIS spherical coverage percentile of the DUT as defined in clause 7.3.4 of TS 38.101-2 [19] for each UE power class.

For UE power class 3, the relative angular offset between the directions (AoAs) of the 2 active probes shall be changed for each test iteration, within the probe alignment described above. The applicable set of relative angular offsets between the 2 active probes is given in Table 3.15.3-1 for each UE power class.

# A.3.16 TCI State Configuration

#### A.3.16.1 Introduction

This clause provides the configurations for TCI states towards either SSB or CSI-RS. The TCI states defined in this clause are configured in each test when applicable to indicate that certain DL signals are QCL'ed with the referenceSignal configured in the TCI states.

#### A.3.16.2 TCI states

Table A.3.16.2-1: TCI States

Parameter	TCI.State.0	TCI.State.1	TCI.State.2	TCI.State.3
tci-StateId	ld0	ld1	ld2	ld3
qcl-Type1	typeC	typeC	typeA	typeA
qcl-Type2 <sup>Note1</sup>	typeD	typeD	typeD	typeD
referenceSignal	SSB0	SSB1	Resource #4 in TRS	Resource #4 in TRS
			resource set 1 Note3	resource set 2 Note3

Note 1: qcl-Type2 of typeD only where applicable. For RRM test cases, this will be only in FR2

Note 2: referenceSignal configurations towards which the TCI states are configured are defined in a testspecific manner.

Note 3: Reference TRS resource sets are defined in A.3.17, and the applicable TRS resource set(s) are specified in each test case. When a single TRS resource set is configured in a test case, it is considered as resource set 1.

Table A.3.16.2-2: Void

# A.3.17 Configurations of CSI-RS for tracking

# A.3.17.1 Configuration of CSI-RS for tracking for FR1

### A.3.17.1.1 FDD

Table A.3.17.1.1-1: CSI-RS for tracking for SCS=15kHz

Parameter	Unit	Value		
Reference channel		TRS.1.1 FDD		
Bandwidth		BW of Active BWP <sup>Note 1</sup>		
SCS	kHz	15		
First subcarrier index in the PRB used for CSI-RS		k₀=0 for CSI-RS resource 1,2,3,4		
First OFDM symbol in the PRB used for		I <sub>0</sub> = 6 for CSI-RS resource 1 and 3		
CSI-RS		l <sub>0</sub> = 10 for CSI-RS resource 2 and 4		
Number of CSI-RS ports (X)		1 for CSI-RS resource 1,2,3,4		
CDM Type		'No CDM' for CSI-RS resource 1,2,3,4		
Density (ρ)		3 for CSI-RS resource 1,2,3,4		
CSI-RS periodicity	slots	20 for CSI-RS resource 1,2,3,4		
CSI-RS offset	slots	10 for CSI-RS resource 1 and 2		
CSI-RS dilset		11 for CSI-RS resource 3 and 4		
EPRE ratio to SSS	dB	-3 <sup>Note 2</sup>		
TCI state		TCI.State.0		
Note 1: BW of TRS is configured same as the BW size of UE active BWP in the RRM test cases				
Note 2: Unless otherwise specified in the test case				

Table A.3.17.1.1-2: CSI-RS for tracking for SCS=30kHz

Parameter		Value		
Reference channel		TRS.1.2 FDD		
Bandwidth		BW of Active BWP <sup>Note 1</sup>		
SCS	kHz	30		
First subcarrier index in the PRB used for CSI-RS		k₀=0 for CSI-RS resource 1,2,3,4		
First OFDM symbol in the PRB used for		I <sub>0</sub> = 6 for CSI-RS resource 1 and 3		
CSI-RS		I <sub>0</sub> = 10 for CSI-RS resource 2 and 4		
Number of CSI-RS ports (X)		1 for CSI-RS resource 1,2,3,4		
CDM Type		'No CDM' for CSI-RS resource 1,2,3,4		
Density (ρ)		3 for CSI-RS resource 1,2,3,4		
CSI-RS periodicity	slots	40 for CSI-RS resource 1,2,3,4		
CSI-RS offset	slots	20 for CSI-RS resource 1 and 2		
CSI-RS Offset		21 for CSI-RS resource 3 and 4		
EPRE ratio to SSS	dB	-3 <sup>Note 2</sup>		
TCI state		TCI.State.0		
Note 1: BW of TRS is configured same as the BW size of UE active BWP in the RRM test cases				
Note 2: Unless otherwise specified in t	he test	case		

## A.3.17.1.2 TDD

Table A.3.17.1.2-1: CSI-RS for tracking for SCS=15kHz

Parameter	Unit	Value		
Reference channel		TRS.1.1 TDD		
Bandwidth		BW of Active BWP <sup>Note 1</sup>		
SCS	kHz	15		
First subcarrier index in the PRB used for CSI-RS		k <sub>0</sub> =0 for CSI-RS resource 1,2,3,4		
First OFDM symbol in the PRB used for		l <sub>0</sub> = 6 for CSI-RS resource 1 and 3		
CSI-RS		l <sub>0</sub> = 10 for CSI-RS resource 2 and 4		
Number of CSI-RS ports (X)		1 for CSI-RS resource 1,2,3,4		
CDM Type		'No CDM' for CSI-RS resource 1,2,3,4		
Density (ρ)		3 for CSI-RS resource 1,2,3,4		
CSI-RS periodicity	slots	20 for CSI-RS resource 1,2,3,4		
CSI-RS offset	slots	10 for CSI-RS resource 1 and 2		
CSI-RS dilset		11 for CSI-RS resource 3 and 4		
EPRE ratio to SSS	dB	-3 <sup>Note 2</sup>		
TCI state		TCI.State.0		
Note 1 BW of TRS is configured same as the BW size of UE active BWP in the RRM test cases				
Note 2: Unless otherwise specified in the test case				

Table A.3.17.1.2-2: CSI-RS for tracking for SCS=30kHz

Parameter	Unit	Value		
Reference channel		TRS.1.2 TDD		
Bandwidth		BW of Active BWP <sup>Note 1</sup>		
SCS	kHz	30		
First subcarrier index in the PRB used for CSI-RS		k₀=0 for CSI-RS resource 1,2,3,4		
First OFDM symbol in the PRB used for		I <sub>0</sub> = 6 for CSI-RS resource 1 and 3		
CSI-RS		I <sub>0</sub> = 10 for CSI-RS resource 2 and 4		
Number of CSI-RS ports (X)		1 for CSI-RS resource 1,2,3,4		
CDM Type		'No CDM' for CSI-RS resource 1,2,3,4		
Density (ρ)		3 for CSI-RS resource 1,2,3,4		
CSI-RS periodicity	slots	40 for CSI-RS resource 1,2,3,4		
CSI-RS offset	slots	20 for CSI-RS resource 1 and 2		
CSI-RS offset		21 for CSI-RS resource 3 and 4		
EPRE ratio to SSS	dB	-3 <sup>Note 2</sup>		
TCI state		TCI.State.0		
Note 1: BW of TRS is configured same as the BW size of UE active BWP in the RRM test cases				
Note 2: Unless otherwise specified in the test case				

# A.3.17.2 Configuration of CSI-RS for tracking for FR2

#### A.3.17.2.1 TDD

Table A.3.17.2.1-1: CSI-RS for tracking for SCS=120kHz Set 1

Parameter	Unit	Value	
Reference channel		TRS.2.1 TDD	
Bandwidth		BW of Active BWP <sup>Note 1</sup>	
SCS	kHz	120	
First subcarrier index in the PRB used for CSI-RS		k <sub>0</sub> =0 for CSI-RS resource 1,2,3,4	
First OFDM symbol in the PRB used for		I <sub>0</sub> = 1 for CSI-RS resource 1 and 3	
CSI-RS		l <sub>0</sub> = 5 for CSI-RS resource 2 and 4	
Number of CSI-RS ports (X)		1 for CSI-RS resource 1,2,3,4	
CDM Type		'No CDM' for CSI-RS resource 1,2,3,4	
Density (ρ)		3 for CSI-RS resource 1,2,3,4	
CSI-RS periodicity	slots	80 for CSI-RS resource 1,2,3,4	
CSI-RS offset	slots	40 for CSI-RS resource 1 and 2	
CSI-NS offset		41 for CSI-RS resource 3 and 4	
EPRE ratio to SSS	dB	-3 <sup>Note 2</sup>	
TCI state		TCI.State.0	
Note 1: BW of TRS is configured same as the BW size of UE active BWP in the RRM test cases  Note 2: Unless otherwise specified in the test case			

Table A.3.17.2.1-2: CSI-RS for tracking for SCS=120kHz Set 2

Parameter		Value		
Reference channel		TRS.2.2 TDD		
Bandwidth		BW of Active BWP <sup>Note 1</sup>		
SCS	kHz	120		
First subcarrier index in the PRB used for CSI-RS		k₀=0 for CSI-RS resource 1,2,3,4		
First OFDM symbol in the PRB used for		I <sub>0</sub> = 2 for CSI-RS resource 1 and 3		
CSI-RS		I <sub>0</sub> = 6 for CSI-RS resource 2 and 4		
Number of CSI-RS ports (X)		1 for CSI-RS resource 1,2,3,4		
CDM Type		'No CDM' for CSI-RS resource 1,2,3,4		
Density (ρ)		3 for CSI-RS resource 1,2,3,4		
CSI-RS periodicity	slots	80 for CSI-RS resource 1,2,3,4		
CSI-RS offset	slots	40 for CSI-RS resource 1 and 2		
CSI-RS offset		41 for CSI-RS resource 3 and 4		
EPRE ratio to SSS	dB	-3 <sup>Note 2</sup>		
TCI state		TCI.State.1		
Note 1: BW of TRS is configured same	as the	BW size of UE active BWP in the RRM test cases		
Note 2: Unless otherwise specified in t	he test	case		

# A.3.18 Additional definitions related to OTA testing for FR2 RRM test cases

### A.3.18.1 Introduction

FR2 RRM test cases are performed over the air (OTA). This clause provides additional definitions and clarifications on the OTA measurements and metrics defined or refered in the test cases.

#### A.3.18.2 PRACH Power Measurement

PRACH power is measured as EIRP(Link=Link angle, Meas=Link angle) as defined in clause 3.1 of TS 38.101-2 [19].

# A.4 EN-DC tests with all NR cells in FR1

- A.4.1 Void
- A.4.2 Void
- A.4.3 RRC CONNECTED state mobility
- A.4.3.1 Void
- A.4.3.2 RRC Connection Mobility Control
- A.4.3.2.1 Void
- A.4.3.2.2 Random Access
- A.4.3.2.2.1 Contention based random access test in FR1 for PSCell in EN-DC
- A.4.3.2.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will verify the requirements in clause 6.2.2.2 and clause 7.1.2 in an AWGN model.

For this test two cells are used, with the configuration of Cell 1 (E-UTRA PCell) specified in clause A.3.7.2.1 and Cell 2 configured as PSCell in FR1. Supported test parameters are shown in Table A.4.3.2.2.1.1-1. UE capble of EN-DC with PSCell in FR1 needs to be tested by using the parameters in Table A.4.3.2.2.1.1-2.

Table A.4.3.2.2.1.1-1: Supported test configurations for contention based random access test in FR1 for PSCell in EN-DC

	Config	Description				
	1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode				
	2	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode				
	3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode				
	4	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode				
Note:	te: The UE is only required to be tested in one of the supported test configurations depending on UE capability					

Table A.4.3.2.2.1.1-2: General test parameters for contention based random access test in FR1 for PSCell in EN-DC

Parameter		Unit	Test-1	Comments
SSB Configuration	Config 1,2		SSB pattern 3 in FR1	As defined in A.3.10
	Config 3,4		SSB pattern 4 in FR1	
Duplex Mode for Cell 2	Config 1,2		FDD	
	Config 3,4		TDD	
TDD Configuration	Config 3,4		TDDConf.2.1	

OCNG Pattern Note 1			OCNG pattern 1	As defined in A.3.2.1.	
PDSCH parameters Config 1,2			SR.1.1 FDD	As defined in A.3.1.1.	
Note 4		Config 3,4	1	SR.2.1 TDD	
NR RF Chann	nel Number			1	
EPRE ratio of	PSS to SS	SS	dB		
EPRE ratio of	PBCH_DN	MRS to SSS	dB		
EPRE ratio of		_	dB		
EPRE ratio of			dB	0	
		PDCCH_DMRS	dB		
EPRE ratio of	_		dB		
EPRE ratio of	PDSCH to	PDSCH_DMRS	dB		
SSB with	$\hat{E_s}/I_{ot}$		dB	3	Power of SSB with index
index 0	$N_{oc}$	Config 1,2	dBm/15kHz	-98	0 is setto be above configured <i>rsrp-</i>
mask s	1 oc	Config 3,4		-101	ThresholdSSB
	$\hat{E}_s/N_{oc}$	1	dB	3	
	SS-RSR	Note 3	dBm/ SCS	-95	
COD with	$\hat{E_s}/I_{ot}$		dB	-17	Power of SSB with index
SSB with index 1	$N_{oc}$	Config 1,2	dBm/15kHz	-98	1 is set to be below configured <i>rsrp</i> -
midex i	1 oc	Config 3,4		-101	ThresholdSSB
	$\hat{E}_s/N_{oc}$		dB	-17	
	SS-RSR	Note 3	dBm/ SCS	-115	
I Note 2		Config 1,2	dBm	-65.3/9.36MHz	For symbols without SSB
lo Note 2		Config 3,4	1	-62.2/38.16MHz	index 1
ss-PBCH-BlockPower		dBm/ SCS	-5	As defined in clause 6.3.2 in TS 38.331 [2].	
Configured UE transmitted power ( $P_{ m CMAX,fc}$ )		dBm	23	As defined in clause 6.2.4 in TS 38.101-1.	
PRACH Confi	guration			FR1 PRACH configuration 1	As defined in A.3.8.2.
Propagation C	Condition		-	AWGN	

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.

Note 2: SS-RSRP, Es/lot and lo levels have been derived from other parameters for information purpose. They are not settable parameters.

Note 3: Void

Note 4: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.

#### A.4.3.2.2.1.2 Test Requirements

Contention based random access is triggered by *not* explicitly assigning a random access preamble via dedicated signalling in the downlink.

#### A.4.3.2.2.1.2.1 Random Access Preamble Transmission

To test the UE behavior specified in Clause 6.2.2.2.1.1 the System Simulator shall receive the Random Access Preamble which belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured *rsrp-ThresholdSSB*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The

relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.4.3.2.2.1.2.2 Random Access Response Reception

To test the UE behavior specified in Clause 6.2.2.2.1.2 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response *not* corresponding to the transmitted Random Access Preamble.

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

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

## A.4.3.2.2.1.2.3 No Random Access Response Reception

To test the UE behavior specified in clause 6.2.2.2.1.3 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preambles.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.4.3.2.2.1.2.4 Receiving an UL grant for msg3 retransmission

To test the UE behavior specified in clause 6.2.2.2.1.4, the System Simulator shall provide an UL grant for msg3 retransmission following a successful Random Access Response.

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

#### A.4.3.2.2.1.2.5 void

A.4.3.2.2.1.2.6 void

#### A.4.3.2.2.1.2.7 Contention Resolution Timer expiry

To test the UE behavior specified in Clause 6.2.2.2.1.6 the System Simulator shall *not* send a response to a msg3.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if the Contention Resolution Timer expires.

## A.4.3.2.2.2 Non-contention based random access test in FR1 for PSCell in EN-DC

# A.4.3.2.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will verify the requirements in clause 6.2.2.2 and clause 7.1.2 in an AWGN model.

For this test two cells are used, with the configuration of Cell 1 (E-UTRA PCell) specified in clause A.3.7.2.1 and Cell 2 configured as PSCell in FR1. Supported test parameters are shown in Table A.4.3.2.2.2.1-1. UE capble of EN-DC with PSCell in FR1 needs to be tested by using the parameters in Table A.4.3.2.2.2.1-2 for SSB-based non-contention based random access test (Test 1) and CSI-RS-based non-contention based random access test (Test 2).

Table A.4.3.2.2.2.1-1: Supported test configurations for non-contention based random access test in FR1 for PSCell in EN-DC

Config Description			
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode		
2	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode		
3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode		
4	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode		
Note: The UE is only required to be tested in one of the supported test configurations depending on UE capability			

Table A.4.3.2.2.1-2: General test parameters for non-contention based random access test in FR1 for PSCell in EN-DC

Parameter		Unit	Test-1	Test-2	Comments
SSB Configuration	Config 1,2		SSB pattern 3 in	SSB pattern 3 in	As defined in A.3.10
		4	FR1	FR1	
	Config 3,4		SSB pattern 4 in	SSB pattern 4 in	
			FR1	FR1	
CSI-RS Configuration	Config 1,2		N/A	CSI-RS.1.1 FDD	As defined in
	Config 3,4			CSI-RS.2.1 TDD	A.3.1.4
Duplex Mode for Cell 2	Config 1,2		FDD	FDD	
	Config 3,4		TDD	TDD	
TDD Configuration	Config 3,4		TDDConf.2.1	TDDConf.2.1	
OCNG Pattern Note 1			OCNG pattern 1	OCNG pattern 1	As defined in
					A.3.2.1.
PDSCH parameters	Config 1,2		SR.1.1 FDD	SR.1.1 FDD	As defined in
Note 4	Config 3,4		SR.2.1 TDD	SR.2.1 TDD	A.3.1.1.
NR RF Channel Number			1	1	
EPRE ratio of PSS to SSS		dB	- 0	0	
EPRE ratio of PBCH_DM	MRS to SSS	dB	] "	0	

EPRE ratio o	f PBCH to	PBCH_DMRS	dB			
EPRE ratio of PDCCH_DMRS to SSS		dB				
EPRE ratio of PDCCH to PDCCH DMRS		dB				
EPRE ratio o	f PDSCH_I	DMRS to SSS	dB			
EPRE ratio o	f PDSCH to	o PDSCH_DMRS	dB			
SSB with	$\hat{E_s}/I_{ot}$		dB	3	3	Power of SSB with
index 0	$N_{oc}$	Config 1,2	dBm/15kHz	-98	-98	index 0 is set to be above configured
	- ' oc	Config 3,4		-101	-101	rsrp-ThresholdSSB
	$\hat{E_s}/N_{oc}$		dB	3	3	
	SS-RSR	RP Note 3	dBm/ SCS	-95	-95	
SSB with index 1	$\hat{E}_s/I_{ot}$		dB	-17	-17	Power of SSB with index 1 is set to be
index i	$N_{oc}$	Config 1,2	dBm/15kHz	-98	-98	below configured
	1 oc	Config 3,4		-101	-101	rsrp-ThresholdSSB
	$\hat{E}_s/N_{oc}$	;	dB	-17	-17	
	SS-RSR	P Note 3	dBm/ SCS	-115	-115	
Io Note 2		Config 1,2	dBm	-65.3/9.36MHz	-65.3/9.36MHz	For symbols without
10		Config 3,4		-62.2/38.16MHz	-62.2/38.16MHz	SSB index 1
ss-PBCH-BlockPower		dBm/ SCS	-5	-5	As defined in clause 6.3.2 in TS 38.331 [2].	
Configured UE transmitted power (		dBm	23	23	As defined in clause	
$P_{ m CMAX,fc})$					6.2.4 in TS 38.101- 1.	
PRACH Con	figuration			FR1 PRACH	FR1 PRACH	As defined in
	-			configuration 2	configuration 3	A.3.8.2.
Propagation	Condition		-	AWGN	AWGN	

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.

Note 2: SS-RSRP, Es/lot and lo levels have been derived from other parameters for information purpose. They are not settable parameters.

Note 3: Void

Note 4: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.

## A.4.3.2.2.2.2 Test Requirements

Non-Contention based random access is triggered by explicitly assigning a random access preamble via dedicated signalling in the downlink. In the test, the non-contention based random access procedure is not initialized for Other SI requested from UE or beam failure recovery.

#### A.4.3.2.2.2.2.1 SSB-based Random Access Preamble Transmission

In Test-1, to test the UE behavior specified in Clause 6.2.2.2.2.1 for SSB-based Random Access Preamble transsision, with the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs configured, the System Simulator shall receive the Random Access Preamble which has the Preamble Index associated with the SSB with index 0.

In addition, the System Simulator shall receive the Random Access Preamble on the PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0, and the selected PRACH occasion shall belongs to the PRACH occasions permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2.. The power of the first preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.4.3.2.2.2.2.2 CSI-RS-based Random Access Preamble Transmission

In Test-2, to test the UE behavior specified in Clause 6.2.2.2.2.1 for CSI-RS-based Random Access Preamble transsision, with the contention-free Random Access Resources and the contention-free PRACH occasions associated with CSI-RSs configured, the System Simulator shall receive the Random Access Preamble which has the Preamble Index associated with the CSI-RS configured.

In addition, the System Simulator shall receive the Random Access Preamble on the PRACH occasion which belongs to the PRACH occasions corresponding to the CSI-RS configured, and the selected PRACH occasion shall belongs to the PRACH occasions permitted by the restrictions given by the *ra-OccasionList*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.4.3.2.2.2.3 Random Access Response Reception

To test the UE behavior specified in Clause 6.2.2.2.2 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response *not* corresponding to the transmitted Random Access Preamble.

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

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.4.3.2.2.2.4 No Random Access Response Reception

To test the UE behavior specified in clause 6.2.2.2.2.3 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preambles.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window configured in *RACH-ConfigCommon*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.4.3.2.3 Void

# A.4.4 Timing

# A.4.4.1 UE transmit timing

# A.4.4.1.1 NR UE Transmit Timing Test for FR1

## A.4.4.1.1.1 Test Purpose and environment

The purpose of this test is to verify that the UE can follow frame timing change of the connected gNodeb and that the UE initial transmit timing accuracy, maximum amount of timing change in one adjustment, minimum and maximum adjustment rate are within the specified limits. This test will verify the requirements in clause 7.1.2. Supported test configurations are shown in Table 4.4.1.1.1-1.

ConfigurationDescription1LTE FDD, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz2LTE FDD, NR TDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz3LTE FDD, NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz4LTE TDD, NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz5LTE TDD, NR TDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz6LTE TDD, NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHzNote:The UE is only required to be tested in one of the supported test configurations

Table A.4.4.1.1.1-1: Supported test configurations for FR1 PSCell

The test consists of E-UTRA PCell and NR PSCell. The configuration for E-UTRA is given in A.3.7.2.1. Table A.4.4.1.1.1-2 defines the parameters to be configured and strength of the transmitted signals. The transmit timing is verified by the UE transmitting SRS using the configuration defined in Table A.4.4.1.1.1-3.

Table A.4.4.1.1.1-2: Cell Specific Test Parameters for UL Transmit Timing test

Parameter	Unit	Config	Test1	Test2	Band Group
SSB ARFCN		1,2,3,4,5,6	Freq1	Freq1	
Duplex Mode		1,4	F	)D	
Duplex Wode		2,3,5,6	TDD		
		1,4	Not Ap	plicable	
TDD configuration		2,5	TDDC	onf.1.1	
		3,6	TDDC	onf.1.2	
		1,4	10: N <sub>R</sub>	<sub>B,c</sub> = 52	
BW <sub>channel</sub>	MHz	2,5	10: N <sub>R</sub>	<sub>B,c</sub> = 52	
		3,6	40: N <sub>RB</sub>	<sub>i,c</sub> = 106	
Initial BWP Configuration		1,2,3,4,5,6		VP.0.1	
Illitial BVVF Colliguration		1,2,3,4,3,0		/P.0.1	
Dedicated BWP Configuration		1,2,3,4,5,6	DLBV ULBV	/P.1.1 /P.1.1	
DRx Cycle	ms	1,2,3,4,5,6	N/A	DRX.5 <sup>Note5</sup>	
PDSCH Reference		1,4	SR.1.1 FDD SR.1.1 TDD		
measurement channel		2,5			
		3,6	SR.2.	1 TDD	
CORESET Reference		1,4	CR.1.	1 FDD	
Channel		2,5	CR.1.1 TDD		
		3,6	CR.2.	1 TDD	]
OCNG Patterns		1,2,3,4,5,6	OCNG p	oattern 1	
		1,4	SSB.		
SSB configuration		2,5	SSB.		
		3,6	SSB.		
SMTC configuration		1,2,3,4,5,6		ΓC.2	
<u> </u>		1,4		.1 FDD	
TRS configuration		2,5		.1 TDD	
		3,6	TRS.1	.2 TDD	
PDSCH/PDCCH	kHz	1,2,4,5	1	5	
subcarrier spacing	KI IZ	3,6	3	0	

EPRE ratio of PSS to SSS  EPRE ratio of PBCH DMRS to SSS  EPRE ratio of PBCH to PBCH DMRS  EPRE ratio of PDCCH DMRS to SSS  EPRE ratio of PDCCH to PDCCH DMRS to SSS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH to PDSCH To PDSCH  EPRE ratio of OCNG DMRS to SSS(Note 1)  EPRE ratio of OCNG to OCNG DMRS (Note 1)	dB	1,2,3,4,5,6	0	0	
$N_{oc}$ Note2	dBm/15 kHz	1,2,3,4,5,6	-98	-98	
$N_{oc}$ Note2	dDm/CCC	1,2,4,5	-98	-98	
1 v oc	dBm/SCS	3,6	-95	-95	
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$		1,2,3,4,5,6	3	3	
$\hat{E}_s/N_{oc}$		1,2,3,4,5,6	3	3	
SS-RSRP <sup>Note3</sup>	dBm/SCS	1,2,4,5	-95	-95	
	ubili/303	3,6	-92	-92	
Io <sup>Note3</sup>	dBm/9.36MHz	1,2,4,5	-65.2	-65.2	
	dBm/38.1MHz	3,6	-59.2	-59.2	
Propagation condition		1,2,3,4,5,6	AWGN		
SRS Config		1,2,4,5	SRSConf.1Note6	SRSConf.3 <sup>Note6</sup>	
		3, 6	SRSConf.1 <sup>Note6</sup>	SRSConf.2 <sup>Note6</sup>	

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

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

Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: DRx related parameters are given in Table A.3.3.5-1

Note 6: SRS configs are given in Table A.4.4.1.1.1-3

Table A.4.4.1.1.1-3: SRS Configuration for Timing Accuracy Test

	Field	SRSConf.1	SRSConf.2	SRSConf.3	Comments
SRS-	srs-ResourceSetId	0	0	0	
ResourceSet	srs-ResourceldList	0	0	0	
	resourceType	Periodic	Periodic	Periodic	
	Usage	Codebook	Codebook	Codebook	
SRS-	SRS-Resourceld	0	0	0	
Resource	nrofSRS-Ports	Port1	Port1	Port1	
	transmissionComb	n2	n2	n2	
	combOffset-n2	0	0	0	
	cyclicShift-n2	0	0	0	_

resourceMapping startPosition	0	0	0	
resourceMapping nrofSymbols	n1	n1	n1	
resourceMapping repetitionFactor	n1	n1	n1	
freqDomainPosition	0	0	0	
freqDomainShift	0	0	0	
freqHopping c-SRS	14 for test configuration 1,2,4,5 25 for test configuration 3,6	25	14	Matches N <sub>RB,c</sub>
freqHopping b-SRS	0	0	0	
freqHopping b-hop	0	0	0	
groupOrSequenceHopping	Neither	Neither	Neither	
resourceType	Periodic	Periodic	Periodic	
periodicityAndOffset-p	sl1, 0	sl640, 0	sl320, 0	Offset to align with DRx periodicity
sequenceld	0	0	0	Any 10 bit number

# A.4.4.1.1.2 Test requirements

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

Following will be the test sequence for this test

- 1) Set up E-UTRA PCell according to parameters given in Table A.3.7.2.1-1 and setup NR PSCell according to parameters given in Table A.4.4.1.1.1-1.
- 2) After connection set up with the cell, the test equipment will verify that the timing of the NR cell is within  $(N_{TA} + N_{TA \text{ offset}}) \times T_c \pm T_e$  of the first detected path of DL SSB.
  - a. The N<sub>TA</sub> offset value (in T<sub>c</sub> units) is 25600
  - b. The T<sub>e</sub> values depend on the DL and UL SCS for which the test is being run and are given in Table 7.1.2-
- 3) The test system shall adjust the timing of the DL path by values given in Table A.4.4.1.1.2-1

Table A.4.4.1.1.2-1: Adjustment Value for DL Timing

SCS of SSB signals (kHz)	Adjustment Value		
	Test1	Test2	
15	+64*64T <sub>c</sub>	+32*64T <sub>c</sub>	
30	+32*64T <sub>c</sub>	+16*64T <sub>c</sub>	

4) The test system shall verify that the adjustment step size and the adjustment rate shall be according to requirements specified in Clause 7.1.2 Table 7.1.2-3 until the UE transmit timing offset is within  $(N_{TA} + N_{TA\_offset}) \times T_c \pm T_e$  respective to the first detected path (in time) of DL SSB. Skip this step for test 2 with DRX configured.

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

# A.4.4.2 UE timer accuracy

# A.4.4.3 Timing advance

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

# A.4.4.3.1.1 Test Purpose and Environment

The purpose of the test is to verify UE Timing Advance adjustment delay and accuracy requirement defined in clause 7.3.

## A.4.4.3.1.2 Test Parameters

Supported test configurations are shown in table A.4.4.3.1.2-1. Both timing advance adjustment delay and accuracy are tested by using the parameters in table A.4.4.3.1.2-2, A.4.4.3.1.2-3 and A.4.4.3.1.2-4. The configuration of Cell 1 (LTE PCell) is specified in clause A.3.7.2.1.

In all test cases, two cells are used. Cell 1 is the PCell in the primary Timing Advance Group (pTAG) and cell 2 is the PSCell is in the secondary Timing Advance Group (sTAG). Each test consists of two successive time periods, with time duration of T1 and T2 respectively. In each time period, timing advance commands for sTAG are sent to the UE and Sounding Reference Signals (SRS), as specified in table A.4.4.3.1.2-3, are sent from the UE and received by the test equipment. By measuring the reception of the SRS, the transmit timing, and hence the timing advance adjustment accuracy, can be measured for PSCell in sTAG.

During time period T1, the test equipment shall send one message with a Timing Advance Command MAC Control Element for sTAG, as specified in clause 6.1.3.4 in TS 38.321 [7]. The Timing Advance Command value shall be set to 31, which according to clause 4.2 in TS 38.213 [3] results in zero adjustment of the Timing Advance. In this way, a reference value for the timing advance for sTAG used by the UE is established.

During time period T2, the test equipment shall send a sequence of messages with Timing Advance Command MAC Control Elements for sTAG, with Timing Advance Command value specified in table A.4.4.3.1.2-2. This value shall result in changes of the timing advance for sTAG used by the UE, and the accuracy of the change shall then be measured, using the SRS sent from the UE.

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

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

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

Table A.4.4.3.1.2-1: Timing advance supported test configurations

Table A.4.4.3.1.2-2: General test parameters for timing advance

Parameter	Unit	Value	Comment
RF channel number		Cell 1: 1	1 for E-UTRAN PCell
		Cell 2: 2	2 for NR PSCell
Initial DL BWP		DLBWP.0.1	As specified in Table A.3.9.2.1-1
Dedicated DL BWP		DLBWP.1.1	As specified in Table A.3.9.2.2-1
Initial UL BWP		ULBWP.0.1	As specified in Table A.3.9.3.1-1
Dedicated UL BWP		ULBWP.1.1	As specified in Table A.3.9.3.2-1
Timing Advance Command (T <sub>A</sub> ) value during T1		31	N <sub>TA_new</sub> = N <sub>TA_old</sub> for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2
Timing Advance Command (T <sub>A</sub> ) value during T2		39	For 15 kHz SCS $N_{TA\_new} = N_{TA\_old} + 8192*T_c$ For 30 kHz SCS $N_{TA\_new} = N_{TA\_old} + 4096*T_c$ (based on equation in clause 4.2 of TS 38.213 [3])
T1	s	5	
T2	s	5	

Table A.4.4.3.1.2-3: Cell specific test parameters for timing advance

Parameter  Config 1,4		Unit	Test1			
		Unit	T1	T2		
Duploy mode	Config 1,4		FC	)D		
Duplex mode	Config 2,3,5,6		TC	)D		
	Config 1,4		Not App	olicable		
TDD configuration	Config 2,5		TDDC			
	Config 3,6		TDDC	onf.2.1		
	Config 1,4		10: N <sub>RE</sub>	-		
BW <sub>channel</sub>	Config 2,5	MHz	10: N <sub>RE</sub>	<sub>3,c</sub> = 52		
	Config 3,6		40: N <sub>RB</sub>			
	Config 1,4		10: N <sub>RE</sub>			
BWP BW	Config 2,5	MHz	10: N <sub>RE</sub>	<sub>3,c</sub> = 52		
	Config 3,6		40: N <sub>RB,c</sub> = 106			
DRx Cycle		ms	Not Applicable			
DDCCU Deference	Config 1,4		SR.1.1 FDD			
PDSCH Reference measurement channel	Config 2,5	1	SR.1.	1 TDD		
measurement channel	Config 3,6		SR2.1 TDD			
CORESET Reference	Config 1,4		CR.1.1 FDD			
Channel	Config 2,5		CR.1.1 TDD			
Onamici	Config 3,6		CR2.1	TDD		
	Config 1,4		TRS.1.1 FDD			
TRS configuration	Config 2,5		TRS.1.1 TDD			
	Config 3,6		TRS.1.			
OCNG Patterns			OCNG p			
SMTC configuration	Config 1,2,4,5		SMTC			
	Config 3,6		SMTC.2 FR1			
PDSCH/PDCCH	Config 1,2,4,5	kHz -	15 k	kHz		
	subcarrier spacing Config 3,6		30 I			
PUCCH/PUSCH Config 1,2,4,5		kHz -	15 l			
subcarrier spacing	Config 3,6	IXI IZ	30 I	30 kHz		
EPRE ratio of PSS to SS		dB	0			
EPRE ratio of PBCH DM	IRS to SSS	db				

BCH DMRS		
RS to SSS		
PDCCH DMRS		
RS to SSS		
PDSCH		
RS to SSS(Note 1)		
CNG DMRS (Note		
dBr	m/15kH	-98
	Z	-90
		-98
dB	m/SCS	-95
	dB	3
	dB	3
	-	-67.57
9.3		01.01
	-	-62.58
38.	.16MHz	
	-	AWGN
	dB	RS to SSS PDCCH DMRS RS to SSS PDSCH RS to SSS(Note 1) CNG DMRS (Note    dBm/15kH z  dBm/SCS  dB  dB  dB  dB  dB  dBm/

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

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

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

Table A.4.4.3.1.2-4: Sounding Reference Symbol Configuration for timing advance

Field		Value	Comment
c-SRS	Config 1,2,4,5	12	
U-3K3	Config 3,6	24	Fraguency happing is disabled
b-S	RS	0	Frequency hopping is disabled
b-h	пор	0	
freqDoma	inPosition	0	Frequency domain position of SRS
freqDon	nainShift	0	
groupOrSequ	ienceHopping	neither	No group or sequence hopping
SRS-Periodi	cityAndOffset	sl5=0	Once every 5 slots
pathlossRe	pathlossReferenceRS		SSB #0 is used for SRS path loss estimation
usa	usage		Codebook based UL transmission
startP	osition	0	resourceMapping setting. SRS on last
nrofSy	mbols	n1	symbol of slot, and 1symbols for SRS
repetition	nFactor	n1	without repetition.
combO	ffset-n2	0	transmissionComb setting
cyclicShift-n2		0	transmissionComb setting
nrofSRS-Ports		port1	Number of antenna ports used for SRS transmission
Note: For further	er information see cla	use 6.3.2 in TS 38	.331 [2].

# A.4.4.3.1.3 Test Requirements

The UE shall apply the signalled Timing Advance value for PSCell in sTAG to the transmission timing at the designated activation time i.e. k+1 slots after the reception of the timing advance command, where k=5.

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

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

# A.4.5 Signaling characteristics

# A.4.5.1 Radio link Monitoring

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

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

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

- UE output power higher than Transmit OFF power -50 dBm (as defined in TS 38.101-3 [20]) means uplink signal
- UE output power equal to or less than Transmit OFF power -50 dBm (as defined in TS 38.101-3 [20]) means no uplink signal.

# A.4.5.1.1 Radio Link Monitoring Out-of-sync Test for FR1 PSCell configured with SSB-based RLM RS in non-DRX mode

### A.4.5.1.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PSCell. This test will partly verify the FR1 PSCell radio link monitoring requirements in clause 8.1.

Supported test configurations are shown in table A.4.5.1.1.1-1. The test parameters are given in Tables A.4.5.1.1.1-2, A.4.5.1.1.1-3, and A.4.5.1.1.1-4 below. There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-1. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.4.5.1.1.1-1 shows the variation of the downlink SNR in the active Cell 2 to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. The UE is configured to perform inter-frequency measurements using Gap Pattern ID #0 (40ms) in test 1.

Table A.4.5.1.1.1-1: Supported test configurations for FR1 PSCell

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

Table A.4.5.1.1.1-2: General test parameters for FR1 out-of-sync testing in non-DRX mode

Parameter		Unit	Value	
				Test 1
Active E-UTRA PCell				Cell 1
E-UTRA RF Ch	E-UTRA RF Channel Number			1
Active PSCell				Cell 2
RF Channel Nu	mber			2
Duplex mode		Config 1, 4		FDD
		Config 2, 3, 5, 6		TDD
BW <sub>channel</sub>		Config 1, 4	MHz	10: N <sub>RB,c</sub> = 52
		Config 2, 5		10: N <sub>RB,c</sub> = 52
		Config 3, 6		40: N <sub>RB,c</sub> = 106
DL initial BWP		Config 1, 2, 3, 4, 5, 6		DLBWP.0.1
configuration				DLDVVP.U. I
DL dedicated B	WP	Config 1, 2, 3, 4, 5, 6		DLBWP.1.1
configuration UL initial BWP		Confin 4 2 2 4 5 6		
		Config 1, 2, 3, 4, 5, 6		ULBWP.0.1
configuration UL dedicated B	M/D	Config 1, 2, 3, 4, 5, 6		
configuration	VVP	Config 1, 2, 3, 4, 5, 6		ULBWP.1.1
TDD Configurat	ion	Config 1, 4		Not Applicable
		Config 2, 5		TDDConf.1.1
		Config 3, 6		TDDConf.2.1
CORESET Reference Channel		Config 1, 4		CR.1.1 FDD
		Config 2, 5		CR.1.1 TDD
		Config 3, 6		CR.2.1 TDD
SSB Configurat	ion	Config 1, 4		SSB.1 FR1
- 3		Config 2, 5		SSB.1 FR1
		Config 3, 6		SSB.2 FR1
SMTC Configur	ation	Config 1, 2, 4, 5		SMTC.1
J		Config 3, 6		SMTC.1
PDSCH/PDCCH	1	Config 1, 2, 4, 5		15 kHz
subcarrier spac	ing	Config 3, 6		30 kHz
PRACH Configu		Config 1, 2, 4, 5		Table A.3.8.2.4-1
0		Config 3, 6		Table A.3.8.2.4-1
SSB index assign	ned as R			0
OCNG parameters			OP.1	
CP length			Normal	
Correlation Matrix and Antenna Configuration			2x2 Low	
Out of sync				1-0
transmission				2
parameters		ation level	CCE	8
· •	Ratio of	hypothetical PDCCH RE	dB	4
energy t		o average SSS RE energy		

	Ratio of hypothetical PDCCH DMRS energy to average SSS RE		dB	4
	energy			
		ecoder granularity		REG bundle size
	REG bun			6
DRX				OFF
Gap pattern ID				gp0
Layer 3 filtering				Enabled
T310 timer			ms	0
T311 timer			ms	1000
N310				1
N311				1
CSI-RS for CSI	reporting	Config 1, 4		CSI-RS.1.1 FDD
		Config 2, 5		CSI-RS.1.1 TDD
		Config 3, 6		CSI-RS.2.1 TDD
CSI-RS for trac	king	Config 1, 4		TRS.1.1 FDD
		Config 2, 5		TRS.1.1 TDD
		Config 3, 6		TRS.1.2 TDD
T1	T1		s	0.2
T2	T2		s	0.48
T3	T3		S	0.48
D1			s	0.44
ALI 4 ALI		. 10 0 11		

All configurations are assigned to the UE prior to the start of time period T1. UE-specific PDCCH is not transmitted after T1 starts. Note 1:

Note 2:

E-UTRAN is in non-DRX mode under test. Note 3:

Table A.4.5.1.1.1-3: Cell specific test parameters for FR1 (Cell 2) for out-of-sync radio link monitoring tests in non-DRX mode

P	arameter	Unit	Test 1		
			T1	T2	Т3
EPRE ratio of P	PRE ratio of PDCCH DMRS to SSS			4	
EPRE ratio of P DMRS	DCCH to PDCCH	dB		0	
EPRE ratio of P	BCH DMRS to SSS	dB			
EPRE ratio of P	BCH to PBCH DMRS	dB			
EPRE ratio of P	SS to SSS	dB			
EPRE ratio of P	DSCH DMRS to SSS	dB		0	
EPRE ratio of P	DSCH to PDSCH	dB			
EPRE ratio of C	CNG DMRS to SSS	dB			
EPRE ratio of C	CNG to OCNG DMRS	dB			
SNR on RLM-	Config 1, 4	dB	1	-7	-15
RS	Config 2, 5		1	-7	-15
	Config 3, 6		1	-7	-15
SNR on other channels and signals	Config 1, 2, 3, 4, 5, 6	dB		1	
W	Config 1, 4	dBm/		-98	
$N_{oc}$	Config 2, 5	15		-98	
	Config 3, 6	kHz		-98	·
M	Config 1, 4	dBm/		-98	
$N_{oc}$	Config 2, 5	SCS		-98	·
	Config 3, 6			-95	·

Propagati	on condition		TDL-C 300ns 100Hz		
Note 1:	OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density				
	is achieved for all OFDM symbols.				
Note 2:	The signal contains PDCCH for UEs other than the device under test as part of OCNG.				
Note 3:	SNR levels correspond to the s REs.	ignal to r	noise ratio over the SSS		

Table A.4.5.1.1.1-4: Measurement gap configuration for out-of-sync tests in non-DRX mode

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

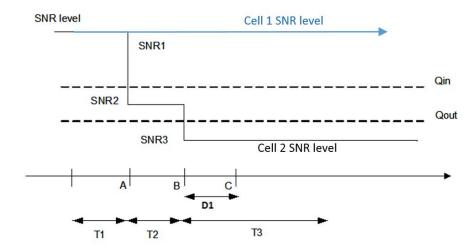


Figure A.4.5.1.1.1-1: SNR variation for out-of-sync testing

# A.4.5.1.1.2 Test Requirements

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

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

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

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

# A.4.5.1.2 Radio Link Monitoring In-sync Test for FR1 PSCell configured with SSB-based RLM RS in non-DRX mode

# A.4.5.1.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PSCell. This test will partly verify the FR1 PSCell radio link monitoring requirements in clause 8.1.

Supported test configurations are shown in table A.4.5.1.2.1-1. The test parameters are given in Tables A.4.5.1.2.1-2, and A.4.5.1.2.1-3 below. There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-1. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.4.5.1.2.1-1 shows the variation of the downlink SNR in the active Cell 2 to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms.

Table A.4.5.1.2.1-1: Supported test configurations for FR1 PSCell

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

Table A.4.5.1.2.1-2: General test parameters for FR1 in-sync testing in non-DRX mode

Parameter		Unit	Value
			Test 1
Active E-UTRA PCell			Cell 1
E-UTRA RF Channel N	Number		1
Active PSCell			Cell 2
RF Channel Number			2
Duplex mode	Config 1, 4		FDD
	Config 2, 3, 5, 6		TDD
BW <sub>channel</sub>	Config 1, 4	MHz	10: N <sub>RB,c</sub> = 52
	Config 2, 5		10: N <sub>RB,c</sub> = 52
	Config 3, 6		40: N <sub>RB,c</sub> = 106
DL initial BWP	Config 1, 2, 3, 4, 5,		DLBWP.0.1
configuration	6		DLBWF.U.1
DL dedicated BWP	Config 1, 2, 3, 4, 5,		DLBWP.1.1
configuration	6		DEBWI .I.I
UL initial BWP	Config 1, 2, 3, 4, 5,		ULBWP.0.1
configuration	6		OLBWI .O. I
UL dedicated BWP	Config 1, 2, 3, 4, 5,		ULBWP.1.1
configuration	6		<u> </u>
TDD Configuration	Config 1, 4		Not Applicable
	Config 2, 5		TDDConf.1.1
	Config 3, 6		TDDConf.2.1
CORESET	Config 1, 4		CR.1.1 FDD
Reference Channel	Config 2, 5		CR.1.1 TDD
	Config 3, 6		CR.2.1 TDD
SSB Configuration	Config 1, 4		SSB.1 FR1
	Config 2, 5		SSB.1 FR1
	Config 3, 6		SSB.2 FR1

OMTO O 5	0 5 4 0 4 5	I	ONATO 4
SMTC Configuration			SMTC.1
	Config 3, 6		SMTC.1
PDSCH/PDCCH	Config 1, 2, 4, 5		15 kHz
subcarrier spacing	Config 3, 6		30 kHz
	<u> </u>		
PRACH	Config 1, 2, 4, 5		Table A.3.8.2.4-1
Configuration	Config 3, 6		Table A.3.8.2.4-1
SSB index assigne	d as RLM RS		0
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix a	and Antenna		2x2 Low
Configuration			
In sync	DCI format		1-0
transmission	Number of Control		2
parameters	OFDM symbols		_
parameters	Aggregation level	CCE	4
	Ratio of hypothetical	dB	0
	PDCCH RE energy to	UD.	O
	average SSS RE		
	energy	-ID	0
	Ratio of hypothetical	dB	0
	PDCCH DMRS energy		
	to average SSS RE		
	energy		
	DMRS precoder		REG bundle size
	granularity		
	REG bundle size		6
Out of sync	DCI format		1-0
transmission	Number of Control		2
parameters	OFDM symbols		
	Aggregation level	CCE	8
	Ratio of hypothetical	dB	4
	PDCCH RE energy to		
	average SSS RE		
	energy		
	Ratio of hypothetical	dB	4
	PDCCH DMRS energy		
	to average SSS RE		
	energy		
	DMRS precoder		REG bundle size
	granularity		
	REG bundle size		6
DRX			OFF
Gap pattern ID			N.A.
Layer 3 filtering			Enabled
T310 timer		ms	1000
T311 timer		ms	1000
N310			1
N311			1
CSI-RS for CSI	Config 1, 4		CSI-RS.1.1 FDD
reporting	Config 2, 5		CSI-RS.1.1 TDD
	Config 3, 6		CSI-RS.2.1 TDD
CSI-RS for	Config 1, 4		TRS.1.1 FDD
tracking	Config 2, 5		TRS.1.1 TDD
	Config 3, 6		TRS.1.2 TDD
T1		s	0.2
T2		S	0.2
			U.Z
		1	
T3		s s	0.24 0.2

T5		S	0.88
D1		S	0.84
Note 1:	All configurations are assigned to th T1.	e UE prio	r to the start of time period
Note 2: UE-specific PDCCH is not transmitted after T1 starts.  Note 3: F-LITRAN is in non-DRX mode under test		1 starts.	

Table A.4.5.1.2.1-3: Cell specific test parameters for FR1 (Cell 2) for in-sync radio link monitoring tests in non-DRX mode

Parameter		Unit	Test 1				
			T1	T2	Т3	T4	T5
EPRE ratio o	f PDCCH DMRS to SSS	dB			4		
EPRE ratio o	f PDCCH to PDCCH DMRS	dB			0		
EPRE ratio o	f PBCH DMRS to SSS	dB					
EPRE ratio o	f PBCH to PBCH DMRS	dB					
EPRE ratio o	f PSS to SSS	dB					
EPRE ratio o	f PDSCH DMRS to SSS	dB			0		
EPRE ratio o	f PDSCH to PDSCH DMRS	dB					
EPRE ratio o	f OCNG DMRS to SSS	dB					
EPRE ratio o	f OCNG to OCNG DMRS	dB					
SNR on	Config 1, 4	dB	1	-7	-15	-4.5	1
RLM-RS	Config 2, 5		1	-7	-15	-4.5	1
	Config 3, 6		1	-7	-15	-4.5	1
SNR on other channels and signals	Config 1, 2, 3, 4, 5, 6	dB	1				
M	Config 1, 4	dBm/			-98		
$N_{oc}$	Config 2, 5	15			-98		
	Config 3, 6	kHz			-98		
M	Config 1, 4	dBm/	-98				
$N_{oc}$	Config 2, 5	SCS	-98				
	Config 3, 6		-95				
Propagation						100Hz	
Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated							
and a constant total transmitted power spectral density is achieved for all OFDM symbols.							

Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.

Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.

Note 4: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in Figure A.4.5.1.2.1-1.

Note 5: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 and T4 is modified as specified in clause A.3.6.

# SNR level SNR1 SNR5 Qin SNR2 SNR4 Qout SNR3 Cell 2 SNR level A B C D E F D1

# Table A.4.5.1.2.1-4: Void

Figure A.4.5.1.2.1-1: SNR variation for in-sync testing

**T4** 

**T5** 

**T3** 

# A.4.5.1.2.2 Test Requirements

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

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

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

T2

# A.4.5.1.3 Radio Link Monitoring Out-of-sync Test for FR1 PSCell configured with SSB-based RLM RS in DRX mode

# A.4.5.1.3.1 Test Purpose and Environment

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

Supported test configurations are shown in table A.4.5.1.3.1-1. The test parameters are given in Tables A.4.5.1.3.1-2 and A.4.5.1.3.1-3. There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-1. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.4.5.1.3.1-1 shows the variation of the downlink SNR in the active Cell 2 to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

Table A.4.5.1.3.1-1: Supported test configurations for FR1 PSCell

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

Table A.4.5.1.3.1-2: General test parameters for FR1 out-of-sync testing in DRX mode

Parameter		Unit	Value
			Test 1
Active E-UTRA PCell			Cell 1
E-UTRA RF Channel Number			1
Active PSCell			Cell 2
RF Channel Number			2
Duplex mode	Config 1, 4		FDD
	Config 2, 3, 5, 6		TDD
BW <sub>channel</sub>	Config 1, 4	MHz	10: N <sub>RB,c</sub> = 52
	Config 2, 5		10: N <sub>RB,c</sub> = 52
	Config 3, 6		40: N <sub>RB,c</sub> = 106
DL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.0.1
DL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.1.1
UL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.0.1
UL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.1.1
TDD Configuration	Config 1, 4		Not Applicable
G	Config 2, 5		TDDConf.1.1
	Config 3, 6		TDDConf.2.1
CORESET Reference	Config 1, 4		CR.1.1 FDD
Channel	Config 2, 5		CR.1.1 TDD
	Config 3, 6		CR.2.1 TDD
SSB Configuration	Config 1, 4		SSB.1 FR1
3	Config 2, 5		SSB.1 FR1
	Config 3, 6		SSB.2 FR1
SMTC Configuration	Config 1, 2, 4, 5		SMTC.1
	Config 3, 6		SMTC.1
PDSCH/PDCCH	Config 1, 2, 4, 5		15 kHz
subcarrier spacing	Config 3, 6		30 kHz
PRACH Configuration	Config 1, 2, 4, 5		Table A.3.8.2.4-1
r ru torr comigaration	Config 3, 6		Table A.3.8.2.4-1
SSB index assigned as RLM RS			0
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and Antenna Configuration			2x2 Low
	DCI format		1-0
	Number of Control		2
	OFDM symbols		-
	Aggregation level	CCE	8

	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX Configuration			DRX.3
Gap pattern ID			N.A.
Layer 3 filtering			Enabled
T310 timer		ms	0
T311 timer		ms	1000
N310			1
N311			1
CSI-RS for CSI	Config 1, 4		CSI-RS.1.1 FDD
reporting	Config 2, 5		CSI-RS.1.1 TDD
	Config 3, 6		CSI-RS.2.1 TDD
CSI-RS for tracking	Config 1, 4		TRS.1.1 FDD
	Config 2, 5		TRS.1.1 TDD
	Config 3, 6		TRS.1.2 TDD
T1		S	0.2
T2		S	0.68
T3		S	0.68
D1		S	0.64

Note 1: All configurations are assigned to the UE prior to the start of time period T1.

Note 2: UE-specific PDCCH is not transmitted after T1 starts.

Note 3: E-UTRAN is in non-DRX mode under test.

Table A.4.5.1.3.1-3: Cell specific test parameters for FR1 (Cell 2) for out-of-sync radio link monitoring tests in DRX mode

Parameter		Unit	Test 1		
			T1	T2	T3
EPRE ratio of PDCCH DMRS to SSS		dB		4	
EPRE ratio	of PDCCH to PDCCH DMRS	dB		0	
EPRE ratio	of PBCH DMRS to SSS	dB			
EPRE ratio	of PBCH to PBCH DMRS	dB			
EPRE ratio	of PSS to SSS	dB		0	
EPRE ratio	of PDSCH DMRS to SSS	dB			
EPRE ratio	of PDSCH to PDSCH DMRS	dB			
EPRE ratio	of OCNG DMRS to SSS	dB			
EPRE ratio	of OCNG to OCNG DMRS	dB			
SNR on	Config 1, 4	dB	1	-7	-15
RLM-RS	Config 2, 5		1	-7	-15
	Config 3, 6		1	-7	-15
SNR on					
other					
channels	Config 1, 2, 3, 4, 5, 6	dB		1	
and					
signals					
N <sub>oc</sub> Config 1, 4		dBm/15k	-98		
Corning 2, 3		Hz	-98		
Config 3, 6				-98	
N <sub>oc</sub> Config 1, 4		dBm/SCS		-98	
1 oc	Config 2, 5	]		-98	
	Config 3, 6			-95	

Propagation condition TDL-C 300ns 100Hz						
Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total						
	transmitted power spectral density is achieved for all OFDM symbols.					
Note 2:	Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.					
Note 3:	SNR levels correspond to the signal to noise ratio over the SSS REs.					
Note 4:	The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in					
	Figure A.4.5.1.3.1-1.					
Note 5:	The SNR values are specified for testing a UE which supports 2RX on at least one band. For					
	testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6.					

Table A.4.5.1.3.1-4: Void
Table A.4.5.1.3.1-5: Void

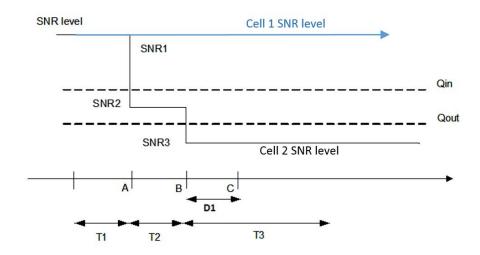


Figure A.4.5.1.3.1-1: SNR variation for out-of-sync testing

## A.4.5.1.3.2 Test Requirements

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

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

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

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

# A.4.5.1.4 Radio Link Monitoring In-sync Test for FR1 PSCell configured with SSB-based RLM RS in DRX mode

## A.4.5.1.4.1 Test Purpose and Environment

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

Supported test configurations are shown in table A.4.5.1.4.1-1. The test parameters are given in Tables A.4.5.1.4.1-2, and A.4.5.1.4.1-3. There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-1. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.4.5.1.4.1-1 shows the variation of the downlink SNR in the active Cell 2 to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

Table A.4.5.1.4.1-1: Supported test configurations for FR1 PSCell

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

Table A.4.5.1.4.1-2: General test parameters for FR1 in-sync testing in DRX mode

Parame	ter	Unit	Value		
			Test 1		
Active E-UTRA PCell			Cell 1		
E-UTRA RF Channel Number			1		
Active PSCell			Cell 2		
RF Channel Number			2		
Duplex mode	Config 1, 4		FDD		
·	Config 2, 3, 5, 6		TDD		
BW <sub>channel</sub>	Config 1, 4	MHz	10: N <sub>RB,c</sub> = 52		
	Config 2, 5		10: N <sub>RB,c</sub> = 52		
	Config 3, 6		40: N <sub>RB,c</sub> = 106		
DL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.0.1		
DL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.1.1		
UL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.0.1		
UL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.1.1		
TDD Configuration	Config 1, 4		Not Applicable		
	Config 2, 5		TDDConf.1.1		
	Config 3, 6		TDDConf.2.1		
CORESET Reference	Config 1, 4		CR.1.1 FDD		
Channel	Config 2, 5		CR.1.1 TDD		
	Config 3, 6		CR.2.1 TDD		
SSB Configuration	Config 1, 4		SSB.1 FR1		
-	Config 2, 5		SSB.1 FR1		
	Config 3, 6		SSB.2 FR1		
SMTC Configuration	Config 1, 2, 4, 5		SMTC.1		
	Config 3, 6		SMTC.1		
	Config 1, 2, 4, 5		15 kHz		

PDSCH/PDCCH subcari	rier Config 3, 6		30 kH-
spacing			30 kHz
PRACH Configuration	Config 1, 2, 4, 5		Table A.3.8.2.4-1
	Config 3, 6		Table A.3.8.2.4-1
SSB index assigned as I	RLM RS		0
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and A	ntenna Configuration		2x2 Low
In sync transmission	DCI format		1-0
parameters	Number of Control OFD symbols	PM	2
	Aggregation level	CCE	4
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	0
	Ratio of hypothetical PDCCH DMRS energy average SSS RE energy		0
	DMRS precoder granula	arity	REG bundle size
	REG bundle size		6
Out of sync	DCI format		1-0
transmission parameters	Number of Control OFD symbols	M	2
•	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB v	4
	Ratio of hypothetical PDCCH DMRS energy average SSS RE energy	dB to	4
	DMRS precoder granula		REG bundle size
	REG bundle size	arity	6
DRX Configuration			DRX.3
Gap pattern ID			N.A.
Layer 3 filtering			Enabled
T310 timer		ms	1000
T311 timer		ms	1000
N310			1
N311			1
CSI-RS for CSI reporting	Config 1, 4		CSI-RS.1.1 FDD
	Config 2, 5		CSI-RS.1.1 TDD
	Config 3, 6		CSI-RS.2.1 TDD
CSI-RS for tracking	Config 1, 4		TRS.1.1 FDD
	Config 2, 5		TRS.1.1 TDD
	Config 3, 6		TRS.1.2 TDD
T1		S	0.2
T2		S	0.2
T3		S	0.64
T4		S	0.2
T5		S	0.88
D1		S	0.84

All configurations are assigned to the UE prior to the start of time period T1. UE-specific PDCCH is not transmitted after T1 starts. Note 1:

Note 2:

E-UTRAN is in non-DRX mode under test. Note 3:

Table A.4.5.1.4.1-3: Cell specific test parameters for FR1 (Cell 2) for in-sync radio link monitoring tests in DRX mode

Parameter		Unit	Test 1				
			T1	T2	Т3	T4	T5
EPRE ratio of	PDCCH DMRS to SSS	dB			4		
EPRE ratio of	PDCCH to PDCCH DMRS	dB			0		
EPRE ratio of	PBCH DMRS to SSS	dB					
EPRE ratio of	PBCH to PBCH DMRS	dB					
EPRE ratio of	PSS to SSS	dB			0		
EPRE ratio of	PDSCH DMRS to SSS	dB					
EPRE ratio of	PDSCH to PDSCH DMRS	dB					
EPRE ratio of	OCNG DMRS to SSS	dB					
EPRE ratio of	EPRE ratio of OCNG to OCNG DMRS						
SNR on	Config 1, 4	dB	1	-7	-15	-4.5	1
RLM-RS	Config 2, 5		1	-7	-15	-4.5	1
	Config 3, 6		1	-7	-15	-4.5	1
SNR on other channels and signals		dB	1				
$N_{oc}$	0 5 4 4				-98		
Config 2, 5		kHz	-98				
Config 3, 6					-98		
N <sub>oc</sub> Config 1, 4 Config 2, 5		dBm/SCS			-98		
					-98		
Config 3, 6			-95				
Propagation of	Propagation condition		TDL-C 300ns 100Hz				

Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.

Note 3:

SNR levels correspond to the signal to noise ratio over the SSS REs.
The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and Note 4: SNR5 respectively in Figure A.4.5.1.4.1-1.

The SNR values are specified for testing a UE which supports 2RX on at least one band. For Note 5: testing of a UE which supports 4RX on all bands, the SNR during T3 and T4 is modified as specified in clause A.3.6.

# Table A.4.5.1.4.1-4: Void Table A.4.5.1.4.1-5: Void

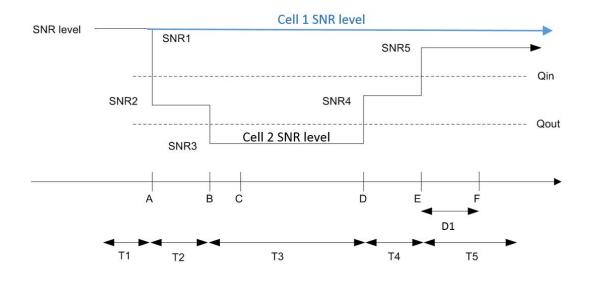


Figure A.4.5.1.4.1-1: SNR variation for in-sync testing

# A.4.5.1.4.2 Test Requirements

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

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

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

# A.4.5.1.5 EN-DC Radio Link Monitoring Out-of-sync Test for FR1 PSCell configured with CSI-RS-based RLM in non-DRX mode

#### A.4.5.1.5.1 Test Purpose and Environment

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

The test parameters are given in Tables A.4.5.1.5.1-1, A.4.5.1.5.1-2, A.4.5.1.5.1-3, and A.4.5.1.5.1-3A below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.4.5.1.5.1-1 shows the variation of the downlink SNR in the E-UTRAN PCell and the PSCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms). In the test, SSB0 is configured as the BFD-RS.

Table A.4.5.1.5.1-1: Supported test configurations for FR1 PSCell

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

Table A.4.5.1.5.1-2: General test parameters for FR1 PSCell for CSI-RS out-of-sync testing in non-DRX mode

Parameter		Unit	Value
			Test 1
Active E-UTRA PCell			Cell 1
E-UTRA RF Channel Number			1
Active PSCell			Cell 2
RF Channel Number			2
Duplex mode	Config 1, 4		FDD
	Config 2, 3, 5, 6		TDD
TDD Configuration	Config 1, 4		Not Applicable
	Config 2, 5		TDDConf.1.1
	Config 3, 6		TDDConf.2.1
DL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.0.1
DL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.1.1
UL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.0.1
UL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.1.1
RMC CORESET Reference	Config 1, 4		CCR.1.1 FDD
Channel	Config 2, 5		CCR.1.1 TDD
	Config 3, 6		CCR.2.1 TDD
SSB Configuration	Config 1, 4		SSB.1 FR1
	Config 2, 5	_	SSB.1 FR1
	Config 3, 6		SSB.2 FR1
SMTC Configuration	Config 1, 2, 4, 5		SMTC.1
	Config 3, 6		SMTC.1
PDSCH/PDCCH subcarrier	Config 1, 2, 4, 5		15 KHz
spacing	Config 3, 6		30 KHz
TRS configuration	Config 1, 4		TRS.1.1 FDD
	Config 2, 5		TRS.1.1 TDD
	Config 3, 6		TRS.1.2 TDD
	Config 1, 4		Resource #4 in TRS.1.1 FDD
CSI-RS for RLM	Config 2, 5		Resource #4 in TRS.1.1 TDD
	Config 3, 6		Resource #4 in TRS.1.2 TDD
TCI configuration for PDCCH/PDS	CH		TCI.State.0
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and Antenna Co	onfiguration		2x2 Low
	DCI format		1-0

	Number of Control OFDM symbols		2
	Aggregation level	CCE	8
Out of sync transmission	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	4
parameters	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX	•		OFF
Gap pattern ID			gp0
Layer 3 filtering			Enabled
T310 timer		ms	0
T311 timer		ms	1000
N310			1
N311			1
CSI-RS for reporting	Config 1, 4		CSI-RS1.1 FDD
	Config 2, 5		CSI-RS.1.1 TDD
	Config 3, 6		CSI-RS.2.1 TDD
T1		S	0.2
T2		S	0.48
T3		S	0.48
D1	1: 11 : 11 ft T4 1 1	S	0.44

Note 1: UE-specific PDCCH is not transmitted after T1 starts.

Note 2: E-UTRAN is in non-DRX mode under test.

Table A.4.5.1.5.1-3: Cell specific test parameters for FR1 for CSI-RS out-of-sync radio link monitoring in non-DRX mode

Pa	rameter	Unit	Test 1		
			T1	T2	T3
PDCCH_bet	a	dB		4	
PDCCH_DM	IRS_beta	dB		4	
PBCH_beta		dB			
PSS_beta		dB			
SSS_beta		dB		0	
PDSCH_bet	а	dB			
OCNG_beta	1	dB			
SNR on	Config 1, 4	dB	1	-7	-15
RLM-RS	Config 2, 5		1	-7	-15
	Config 3, 6		1	-7	-15
SNR on	Config 1, 4	dB		1	
other	Config 2, 5			1	
channels	Config 3, 6			1	
and signals					
N <sub>oc</sub>	Config 1, 4	dBm/15K	-98		
OC .	Config 2, 5	Hz	-98		
	Config 3, 6			-98	

Propagat	tion condition		TDL-C 300ns 100Hz
Note 1:	total transmitted pov	ver spectral	he resources in Cell 2 are fully allocated and a constant density is achieved for all OFDM symbols.
Note 2:	The uplink resource period T1.	s for CSI rep	porting are assigned to the UE prior to the start of time
Note 3:	NZP CSI-RS resour the start of time peri	_	guration for CSI reporting are assigned to the UE prior to
Note 4:	Measurement gap c	onfiguration	is assigned to the UE prior to the start of time period T1.
Note 5:	The timers and laye period T1.	r 3 filtering r	elated parameters are configured prior to the start of time
Note 6:	The signal contains	PDCCH for	UEs other than the device under test as part of OCNG.
Note 7:	SNR levels correspond	ond to the sig	gnal to noise ratio over the SSS REs.
Note 8:	The SNR in time per respectively in figure		and T3 is denoted as SNR1, SNR2 and SNR3 -1.
Note 9:			or testing a UE which supports 2RX on at least one band. rts 4RX on all bands, the SNR during T3 is [A.3.6].

Table A.4.5.1.5.1-3A: Measurement gap configuration for FR1 CSI-RS out-of-sync radio link monitoring in non-DRX mode

	Field		
	Value		
	gapOffset	0	
Note 1:	E-UTRAN PCell and PSCe	ell are SFN-	
	synchronous and frame bo	undary	
	aligned.		

Table A.4.5.1.5.1-4: Void

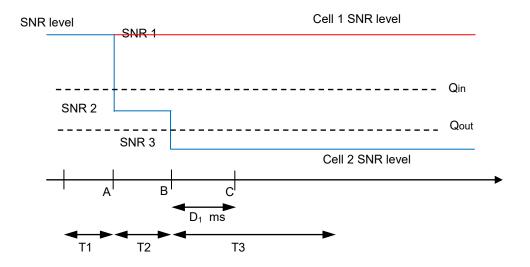


Figure A.4.5.1.5.1-1: SNR variation for CSI-RS out-of-sync testing

# A.4.5.1.5.2 Test Requirements

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

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 2 (PSCell) at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 2.

The UE shall stop transmitting uplink signal in Cell 2 (PSCell) no later than time point C ( $D_1$  after the start of the time duration T3) on the PSCell.

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

# A.4.5.1.6 EN-DC Radio Link Monitoring In-sync Test for FR1 PSCell configured with CSI-RS-based RLM in non-DRX mode

# A.4.5.1.6.1 Test Purpose and Environment

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

The test parameters are given in Tables A.4.5.1.6.1-1, A.4.5.1.6.1-2, and A.4.5.1.6.1-3 below. There are two cells, cell 1 which is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.4.5.1.6.1-1 shows the variation of the downlink SNR in the PSCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. In the test, DRX configuration is not enabled. In the test, SSB0 is configured as the BFD-RS.

Table A.4.5.1.6.1-1: Supported test configurations for FR1 PSCell

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

Table A.4.5.1.6.1-2: General test parameters for FR1 PSCell for CSI-RS in-sync testing in non-DRX mode

Param	neter	Unit	Value
			Test 1
Active E-UTRA PCell			Cell 1
E-UTRA RF Channel Number			1
Active PSCell	Active PSCell		Cell 2
RF Channel Number			2
Duplex mode	Config 1, 4		FDD
	Config 2, 3, 5, 6		TDD
TDD Configuration Config 1, 4			Not Applicable
	Config 2, 5		TDDConf.1.1
	Config 3, 6		TDDConf.2.1

			T	
DL initial BWP configuration		Config 1, 2, 3, 4, 5,		DLBWP.0.1
		6		
DL dedicated BWP configuration		Config 1, 2, 3, 4, 5,		DLBWP.1.1
		6 Config 1, 2, 3, 4, 5,		
UL initial BWP configuration		6		ULBWP.0.1
		Config 1, 2, 3, 4, 5,		
UL dedicated BWP configura	ation	6		ULBWP.1.1
RMC CORESET Reference		Config 1, 4		CCR.1.1 FDD
Channel	-	Config 2, 5		CCR.1.1 TDD
	-	Config 3, 6		CCR.2.1 TDD
SSB Configuration		Config 1, 4		SSB.1 FR1
COB Comigaration	•	Config 2, 5		SSB.1 FR1
	-	Config 3, 6		SSB.2 FR1
SMTC Configuration		Config 1, 2, 4, 5		SMTC.1
- Civi i C Configuration	•	Config 3, 6		SMTC.1
PDSCH/PDCCH subcarrier s	enacina	Config 1, 2, 4, 5		15 KHz
	spacing			30 KHz
TRS configuration		Config 3, 6		
TRO COMIGUIATION	-	Config 1, 4		TRS.1.1 FDD
		Config 2, 5		TRS.1.1 TDD
		Config 3, 6		TRS.1.2 TDD
	,	Config 1, 4		Resource #4 in TRS.1.1 FDD
CSI-RS for RLM	-	Config 2, 5		Resource #4 in TRS.1.1 TDD
		Config 3, 6		Resource #4 in TRS.1.2 TDD
TCI configuration for PDCCF	H/PDSCH			TCI.State.0
OCNG parameters				OP.1
CP length				Normal
Correlation Matrix and Anten	na Config	guration		2x2 Low
	DCI fo			1-0
	Number of Control OFDM			2
Out of sync transmission	symbols			
parameters	Aggregation level		CCE	8
		of hypothetical	dB	4
		H RE energy to		·
	avera	ge CSI-RS RE		
	energ			
	Ratio	of hypothetical	dB	4
		CH DMRS energy to		·
		ge CSI-RS RE		
	energ	•		
		S precoder granularity		REG bundle size
		oundle size		6
	DCI fo			1-0
		er of Control OFDM		2
In sync transmission	symbo			
parameters		gation level	CCE	Л
Paramotors			dB	<u>4</u> 0
		of hypothetical	uB	U
		H RE energy to		
		ge CSI-RS RE		
	energ		10	
		of hypothetical	dB	0
	PDCC	CH DMRS energy to		
	average CSI-RS RE			
	energ			BEOL " :
		S precoder granularity		REG bundle size
	REG	oundle size		6
DRX				OFF
Gap pattern ID				N.A.
Layer 3 filtering				Enabled
T310 timer		<u> </u>	ms	1000
1010 1111101				

T311 timer		ms	1000	
N310	N310		1	
N311			1	
CSI-RS for reporting	Config 1, 4		CSI-RS.1.1 FDD	
	Config 2, 5		CSI-RS.1.1 TDD	
	Config 3, 6		CSI-RS.2.1 TDD	
T1	T1		0.2	
T2	T2		0.2	
T3		S	0.44	
T4	T4		0.2	
T5		S	0.88	
T6		S	0.84	
Note 1: UE-specific PDCCH is not transmitted after T1 starts.				
Note 2: E-UTRAN is in non-DRX mode under test.				

Table A.4.5.1.6.1-3: Cell specific test parameters for FR1 for CSI-RS in-sync radio link monitoring in non-DRX mode

Parameter		Unit			Test 1		
			T1	T2	T3	T4	T5
PDCCH_beta		dB			4		
PDCCH_DMRS	S_beta	dB			4		
PBCH_beta		dB					
PSS_beta		dB					
SSS_beta		dB			0		
PDSCH_beta		dB					
OCNG_beta		dB					
SNR on	Config 1, 4	dB	1	-7	-15	-4.5	1
RLM-RS	Config 2, 5		1	-7	-15	-4.5	1
	Config 3, 6		1	-7	-15	-4.5	1
SNR on other	Config 1, 4	dB			1		
channels and	Config 2, 5				1		
signals	Config 3, 6		1				
$N_{oc}$	Config 1, 4	dBm/15KHz			-98		
¹ v oc	Config 2, 5				-98		
	Config 3, 6		-98				
Propagation co	ndition			TDI	L-C 300ns 10	0Hz	

- Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
- Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
- Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
- Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
- Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure A.4.5.1.6.1-1.
- Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is [A.3.6].

Table A.4.5.1.6.1-3A: Void

Table A.4.5.1.6.1-4: Void

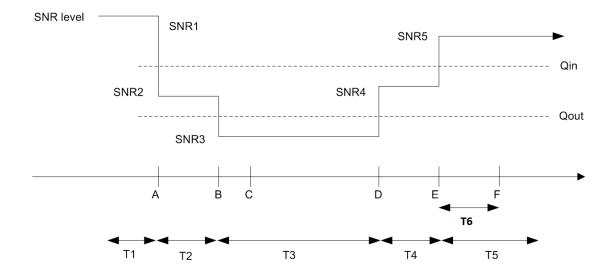


Figure A.4.5.1.6.1-1: SNR variation for CSI-RS in-sync testing

# A.4.5.1.6.2 Test Requirements

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

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

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

# A.4.5.1.7 EN-DC Radio Link Monitoring Out-of-sync Test for FR1 PSCell configured with CSI-RS-based RLM in DRX mode

#### A.4.5.1.7.1 Test Purpose and Environment

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

The test parameters are given in Tables A.4.5.1.7.1-1, A.4.5.1.7.1-2, and A.4.5.1.7.1-3 below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.4.5.1.7.1-1 shows the variation of the downlink SNR in the E-UTRAN PCell and the PSCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. In the test, DRX configuration is enabled in PSCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test. In the test, SSB0 is configured as the BFD-RS.

Table A.4.5.1.7.1-1: Supported test configurations for FR1 PSCell

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

Table A.4.5.1.7.1-2: General test parameters for FR1 PSCell for CSI-RS out-of-sync testing in DRX mode

Parameter		Unit	Value
			Test 1
Active E-UTRA PCell			Cell 1
E-UTRA RF Channel Number			1
Active PSCell			Cell 2
RF Channel Number	T		2
Duplex mode	Config 1, 4		FDD
	Config 2, 3, 5, 6		TDD
TDD Configuration	Config 1, 4	_	Not Applicable
	Config 2, 5	_	TDDConf.1.1
DI : ::: I DIMD	Config 3, 6		TDDConf.2.1
DL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.0.1
DL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.1.1
UL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.0.1
UL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.1.1
RMC CORESET Reference	Config 1, 4		CCR.1.1 FDD
Channel	Config 2, 5		CCR.1.1 TDD
	Config 3, 6		CCR.2.1 TDD
SSB Configuration	Config 1, 4		SSB.1 FR1
	Config 2, 5		SSB.1 FR1
	Config 3, 6		SSB.2 FR1
SMTC Configuration	Config 1, 2, 4, 5		SMTC.1
	Config 3, 6		SMTC.1
PDSCH/PDCCH subcarrier	Config 1, 2, 4, 5		15 KHz
spacing	Config 3, 6	1	30 KHz
TRS configuration	Config 1, 4		TRS.1.1 FDD
	Config 2, 5		TRS.1.1 TDD
	Config 3, 6		TRS.1.2 TDD
	Config 1, 4		Resource #4 in TRS.1.1 FDD
CSI-RS for RLM	Config 2, 5		Resource #4 in TRS.1.1 TDD
	Config 3, 6		Resource #4 in TRS.1.2 TDD
TCI configuration for PDCCH/PDSCH			TCI.State.0
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and Antenna	Configuration		2x2 Low
	DCI format		1-0

	Number of Control OFDM		2
	symbols		
	Aggregation level	CCE	8
	Ratio of hypothetical	dB	4
	PDCCH RE energy to		
	average CSI-RS RE		
Out of sync transmission	energy		
parameters	Ratio of hypothetical	dB	4
	PDCCH DMRS energy to		
	average CSI-RS RE		
	energy		
	DMRS precoder		REG bundle size
	granularity		
	REG bundle size		6
DRX			DRX.3
Gap pattern ID			N.A.
Layer 3 filtering			Enabled
T310 timer		ms	0
T311 timer		ms	1000
N310			1
N311			1
CSI-RS for reporting	Config 1, 4		CSI-RS.1.1 FDD
	Config 2, 5		CSI-RS.1.1 TDD
	Config 3, 6		CSI-RS.2.1 TDD
T1		S	0.2
T2		S	1.28
T3		S	1.28
D1		S	1.24
Note 1: UE-specific PDC0	CH is not transmitted after T1 starts	 3.	

Table A.4.5.1.7.1-3: Cell specific test parameters for FR1 for CSI-RS out-of-sync radio link monitoring in DRX mode

Pa	Parameter			Test 1	
			T1	T2	T3
PDCCH_be	eta	dB		4	
PDCCH_D	MRS_beta	dB		4	
PBCH_beta	a	dB			
PSS_beta		dB			
SSS_beta		dB		0	
PDSCH_be	eta	dB			
OCNG_bet	a	dB			
SNR	Config 1, 4	dB	1	-7	-15
	Config 2, 5		1	-7	-15
	Config 3, 6	=	1	-7	-15
SNR on	Config 1, 4	dB		1	
other	Config 2, 5		1		
channels	Config 3, 6		1		
and signals					
$N_{oc}$	Config 1, 4	dBm/15KHz	KHz -98		
¹ v oc	Config 2, 5		-98		
	Config 3, 6			-98	
Propagatio	n condition			TDL-C 300ns 100h	-lz

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

Table A.4.5.1.7.1-3A: Void

Table A.4.5.1.7.1-4: Void

Table A.4.5.1.7.1-5: Void

Table A.4.5.1.7.1-6: Void

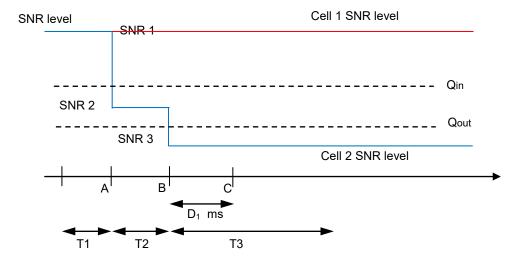


Figure A.4.5.1.7.1-1: SNR variation for CSI-RS out-of-sync testing

### A.4.5.1.7.2 Test Requirements

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

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 2 (PSCell) at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 2.

The UE shall stop transmitting uplink signal in Cell 2 (PSCell) no later than time point C ( $D_1$  after the start of the time duration T3) on the PSCell.

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

## A.4.5.1.8 EN-DC Radio Link Monitoring In-sync Test for FR1 PSCell configured with CSI-RS-based RLM in DRX mode

### A.4.5.1.8.1 Test Purpose and Environment

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

The test parameters are given in Tables A.4.5.1.8.1-1, A.4.5.1.8.1-2, A.4.5.1.8.1-3 and A.4.5.1.8.1-3A below. There are two cells, cell 1which is the E-UTRAN PCell, and cell 2 is the NR PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.4.5.1.8.1-1 shows the variation of the downlink SNR in the PSCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms). In the test, SSB0 is configured as the BFD-RS.

Table A.4.5.1.8.1-1: Supported test configurations for FR1 PSCell

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

Table A.4.5.1.8.1-2: General test parameters for FR1 PSCell for CSI-RS in-sync testing in DRX mode

Paramo	eter	Unit	Value
			Test 1
Active E-UTRA PCell			Cell 1
E-UTRA RF Channel Number			1
Active PSCell			Cell 2
RF Channel Number			2
Duplex mode	Config 1, 4		FDD
	Config 2, 3, 5, 6		TDD
TDD Configuration	Config 1, 4		Not Applicable
	Config 2, 5		TDDConf.1.1
	Config 3, 6		TDDConf.2.1
DL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.0.1
DL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.1.1
UL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.0.1
UL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.1.1
RMC CORESET Reference	Config 1, 4		CCR.1.1 FDD
Channel	Config 2, 5		CCR.1.1 TDD
	Config 3, 6		CCR.2.1 TDD
SSB Configuration	Config 1, 4		SSB.1 FR1
	Config 2, 5		SSB.1 FR1
	Config 3, 6		SSB.2 FR1
SMTC Configuration	Config 1, 2, 4, 5		SMTC.1
	Config 3, 6		SMTC.1
PDSCH/PDCCH subcarrier	Config 1, 2, 4, 5		15 KHz
spacing	Config 3, 6		30 KHz
TRS configuration	Config 1, 4		TRS.1.1 FDD
	Config 2, 5		TRS.1.1 TDD
	Config 3, 6		TRS.1.2 TDD
	Config 1, 4		Resource #4 in TRS.1.1 FDD
CSI-RS for RLM	Config 2, 5		Resource #4 in TRS.1.1 TDD
	Config 3, 6		Resource #4 in TRS.1.2 TDD
TCI configuration for PDCCH/F	PDSCH		TCI.State.0
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and Antenna	a Configuration		2x2 Low

Out of sync transmission	DCI format		1-0	
parameters	Number of Control		2	
	OFDM symbols			
	Aggregation level	CCE	8	
	Ratio of hypothetical	dB	4	
	PDCCH RE energy to			
	average CSI-RS RE			
	energy			
	Ratio of hypothetical	dB	4	
	PDCCH DMRS energy			
	to average CSI-RS RE			
	energy			
	DMRS precoder		REG bundle size	
	granularity		_	
<del> </del>	REG bundle size		6	
In sync transmission	DCI format		1-0	
parameters	Number of Control		2	
	OFDM symbols	005		
	Aggregation level	CCE	4	
	Ratio of hypothetical PDCCH RE energy to	dB	0	
	average CSI-RS RE			
	energy			
		40		
	Ratio of hypothetical PDCCH DMRS energy	dB	0	
	to average CSI-RS RE			
	energy			
	DMRS precoder		REG bundle size	
	granularity		NEO Bariale 3126	
	REG bundle size		6	
DRX	THE SUITAR SIZE		DRX.3	
Gap pattern ID			gp0	
Layer 3 filtering			Enabled	
T040 #:			0000	
T310 timer T311 timer		ms	2000 1000	
N310		ms	·	
N311			<u>1</u> 1	
CSI-RS for reporting	Config 1 4		CSI-RS.1.1 FDD	
Col-No for reporting	Config 1, 4 Config 2, 5		CSI-RS.1.1 TDD	
	Config 2, 5 Config 3, 6	-	CSI-RS.2.1 TDD	
T1	Coming 5, 6	s	0.2	
T2		S	0.2	
T3		S	1.24	
T4		s	0.2	
T5		s	1.88	
T6		s	1.84	
	l is not transmitted after T1 sta			

Table A.4.5.1.8.1-3: Cell specific test parameters for FR1 for CSI-RS in-sync radio link monitoring in DRX mode

Parameter	Unit	Test 1				
		T1	T2	Т3	T4	T5

PDCCH_beta		dB		4				
PDCCH DMRS beta		dB	4					
PBCH_beta		dB						
PSS_beta		dB						
SSS_beta		dB		0				
PDSCH_beta		dB						
OCNG_beta		dB						
SNR on	Config 1, 4	dB	1	-7	-15	-4.5	1	
RLM-RS	Config 2, 5		1	-7	-15	-4.5	1	
	Config 3, 6		1	-7	-15	-4.5	1	
SNR on other	Config 1, 4	dB	1					
channels and	Config 2, 5				1			
signals Config 3, 6					1			
N <sub>oc</sub> Config 1, 4		dBm/15KHz	-98					
OC	Config 2, 5		-98					
	Config 3, 6				-98		•	
Propagation co	ndition			TD	L-C 300ns 10	0Hz		

- Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
- Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
- Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
- Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
- Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure A.4.5.1.8.1-1.
- Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is [A.3.6].

Table A.4.5.1.8.1-3A: Measurement gap configuration for FR1 CSI-RS in-sync radio link monitoring in DRX mode

	Test 1			
	Field			
	gapOffset	0		
Note 1:	E-UTRAN PCell and PSCe synchronous and frame bo aligned.			

Table A.4.5.1.8.1-4: Void

Table A.4.5.1.8.1-5: Void

Table A.4.5.1.8.1-6: Void

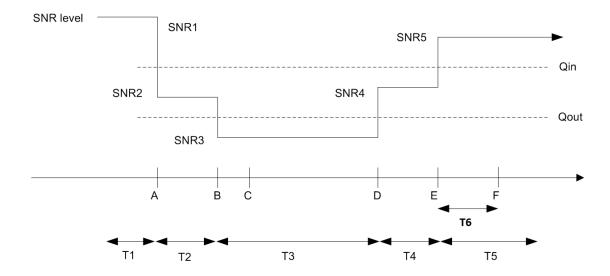


Figure A.4.5.1.8.1-1: SNR variation for CSI-RS in-sync testing

### A.4.5.1.8.2 Test Requirements

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

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

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

## A.4.5.2 Interruption

## A.4.5.2.1 E-UTRAN – NR FR1 interruptions at transitions between active and non-active during DRX in synchronous EN-DC

### A.4.5.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that when LTE PCell is in DRX and NR PSCell is in non-DRX, NR PSCell interruptions due to transitions from active to non-active and from non-active to active during LTE PCell DRX the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for NR PSCell in EN-DC specified in TS38.133 clause 8. 2.1.2. Supported test configurations are shown in table A.4.5.2.1.1-1.

The general test parameters and NR cell specific test parameters are given in Table A.4.5.2.1.1-2 and A.4.5.2.1.1-3. The E-UTRAN PCell DRX configuration parameters are given in Table A.4.5.2.1.1-4 below. And the E-UTRAN cell specific test parameters can refer to Table A.3.7.2.1-1. In the test there are two cells: Cell1 and Cell2. Cell1 is LTE PCell and Cell2 is NR FR1 PSCell. The test consists of one time period, with duration of T1. During T1, NR PSCell is continuously scheduled in DL while LTE PCell is not scheduled and has DRX configured. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell1 and Cell2. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. Prior to start of T1 the DRX inactivity timer for the LTE PCell has already expired. During T1 the UE shall be continuously scheduled on NR PSCell while not scheduled on LTE PCell. CORESET indicating a new transmission on PSCell shall be sent continuously during the entire time duration to ensure UE would not enter DRX state on PSCell.

Table A.4.5.2.1.1-1: Interruption at transitions between active and non-active during DRX supported test configurations

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

Table A.4.5.2.1.1-2: General test parameters for E-UTRAN – NR FR1 interruptions at transitions between active and non-active during DRX in synchronous EN-DC

Parameter	Unit	Value	Comment
RF Channel Number		1, 2	One is E-UTRAN RF channel and the
		1, 2	other is NR RF channel
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Configured PSCell		Cell2	PSCell on NR RF channel number 2.
CP length		Normal	Applicable to Cell1 and Cell2
DRX		DRX.4	DRX related parameters are defined in
		DKA.4	Table A.3.3.4-1
Measurement gap pattern		OFF	
Id		OFF	
T1	S	10	

Table A.4.5.2.1.1-3: NR cell specific test parameters for E-UTRAN – NR FR1 interruptions at transitions between active and non-active during DRX in synchronous EN-DC

Paramet	ter	Unit	Cell2
Frequency Range			FR1
Duplex mode	Config 1,4		FDD
	Config 2,3,5,6		TDD
TDD configuration	Config 1,4		Not Applicable
	Config 2,5		TDDConf.1.1
	Config 3,6		TDDConf.2.1
BW <sub>channel</sub>	Config 1,4		10: N <sub>RB,c</sub> = 52
	Config 2,5		10: N <sub>RB,c</sub> = 52
	Config 3,6		40: N <sub>RB,c</sub> = 106
Initial BWP	Config 1,4		DLBWP.0
Configuration	Config 2,5		DLBWP.0
	Config 3,6		DLBWP.0
PDSCH Reference	Config 1,4		SR.1.1 FDD
measurement channel	Config 2,5		SR.1.1 TDD
	Config 3,6		SR.2.1 TDD
RMSI CORESET	Config 1,4		CR.1.1 FDD
parameters	Config 2,5		CR.1.1 TDD
	Config 3,6		CR.2.1 TDD
PDCCH CORESET	Config 1,4		CCR.1.1 FDD
parameters	Config 2,5		CCR.1.1 TDD
	Config 3,6		CCR.2.1 TDD

OCNG Patterns			OP.1
SMTC Configuration			SMTC.1
TRS configuration	Config 1,4		TRS.1.1 FDD
	Config 2,5		TRS.1.1 TDD
	Config 3,6		TRS.1.2 TDD
SSB Configuration	Config 1,2,4,5		SSB.1 FR1
	Config 3,6		SSB.2 FR1
Correlation Matrix and Ar	itenna		1x2 Low
Configuration			
EPRE ratio of PSS to SS	S		
EPRE ratio of PBCH DMI	RS to SSS		
EPRE ratio of PBCH to P	BCH DMRS		
EPRE ratio of PDCCH DN	MRS to SSS		
EPRE ratio of PDCCH to	PDCCH DMRS		
EPRE ratio of PDSCH DN	MRS to SSS	dB	0
EPRE ratio of PDSCH to	PDSCH		
EPRE ratio of OCNG DM	RS to SSS(Note		
1)			
EPRE ratio of OCNG to C	OCNG DMRS		
(Note 1)			
N <sub>oc</sub> Note 2		dBm/15	-104
		kHz	-104
SS-RSRP Note 3		dBm/15	-87
		kHz	
Ê <sub>s</sub> /I <sub>ot</sub>		dB	17
Ê <sub>s</sub> /N <sub>oc</sub>		dB	17
Io <sup>Note3</sup>	Config 1,2,4,5	dBm/	-58.96
	55111g 1,2,1,0	9.36MHz	55.55
	Config 3,6	dBm/	-52.86
	55.mg 5,5	38.16MHz	
Time offset to Cell1 Note 4		μS	33
Propagation Condition			AWGN

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

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for N<sub>oc</sub> to be fulfilled.

Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselvess.

Note 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells

### Table A.4.5.2.1.1-4: Void

### A.4.5.2.1.2 Test Requirements

The UE shall be continuously scheduled in NR PSCell during the entire length of T1. UE shall not be scheduled in LTE PCell during T1. During the time duration T1 the UE shall transmit at least 99% of ACK/NACK on NR PSCell.

Interruption on NR PSCell shall not exceed X as defined in Table A.4.5.2.1.2-1.

Table A.4.5.2.1.2-1: Interruption length X at transition between active and non-active during DRX

11.	NR Slot	Interruption length X		
<i>,</i> , , , , , , , , , , , , , , , , , ,	length (ms)	Sync		
0	1	1		
1	0.5	1		

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

# A.4.5.2.2 E-UTRAN – NR FR1 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC

### A.4.5.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that when LTE PCell is in DRX and NR PSCell is in non-DRX, NR PSCell interruptions due to transitions from active to non-active and from non-active to active during LTE PCell DRX the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for NR PSCell in EN-DC specified in TS 38.133 clause 8.2.1.2. Supported test configurations are shown in table A.4.5.2.2.1-1.

The general test parameters and NR cell specific test parameters are given in Table A.4.5.2.2.1-2 and A.4.5.2.2.1-3. The E-UTRAN PCell DRX configuration parameters are given in Table A.4.5.2.2.1-4 below. And the E-UTRAN cell specific test parameters can refer to Table A.3.7.2.1-1. In the test there are two cells: Cell1 and Cell2. Cell1 is LTE PCell and Cell2 is NR FR1 PSCell. The test consists of one time period, with duration of T1. During T1, NR PSCell is continuously scheduled in DL while LTE PCell is not scheduled and has DRX configured. Prior to the start of the time duration T1, Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. Prior to start of T1 the DRX inactivity timer for the LTE PCell has already expired. During T1 the UE shall be continuously scheduled on NR PSCell while not scheduled on LTE PCell. PDCCH indicating a new transmission on PSCell shall be sent continuously during the entire time duration to ensure UE would not enter DRX state on PSCell.

Table A.4.5.2.2.1-1: Interruption at transitions between active and non-active during DRX supported test configurations

Co	onfig	Description
	1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
	2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
	3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
	4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
	5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
	6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: T	Γhe UE is only r	equired to be tested in one of the supported test configurations

Table A.4.5.2.2.1-2: General test parameters for E-UTRAN – NR FR1 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC

Parameter	Unit	Value	Comment
RF Channel Number		1, 2	One is E-UTRAN RF channel and the
		1, 2	other is NR RF channel
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Configured PSCell		Cell2	PSCell on NR RF channel number 2.
CP length		Normal	Applicable to Cell1 and Cell2
DRX		DRX.6	DRX related parameters are defined in
		DIXX.0	Table A.3.3.6-1
Measurement gap pattern		OFF	
Id		OFF	
T1	s	10	

Table A.4.5.2.2.1-3: NR cell specific test parameters for E-UTRAN – NR FR1 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC

Parameter		Unit	Cell2
Frequency Range			FR1
Duplex mode Config 1,4			FDD
	Config 2,3,5,6		TDD
TDD configuration	Config 1,4		Not Applicable
	Config 2,5		TDDConf.1.1
	Config 3,6		TDDConf.2.1
BW <sub>channel</sub>	Config 1,4		10: N <sub>RB,c</sub> = 52
	Config 2,5		10: N <sub>RB,c</sub> = 52
	Config 3,6		40: N <sub>RB,c</sub> = 106
Initial BWP	Config 1,4		DLBWP.0
Configuration	Config 2,5		DLBWP.0
	Config 3,6		DLBWP.0
PDSCH Reference	Config 1,4		SR.1.1 FDD
measurement channel	Config 2,5		SR.1.1 TDD
	Config 3,6		SR.2.1 TDD
RMSI CORESET	Config 1,4		CR.1.1 FDD
parameters	Config 2,5		CR.1.1 TDD
	Config 3,6		CR.2.1 TDD
PDCCH CORESET	Config 1,4		CCR.1.1 FDD
parameters	Config 2,5		CCR.1.1 TDD
	Config 3,6		CCR.2.1 TDD
OCNG Patterns			OP.1
SMTC Configuration			SMTC.1
TRS configuration Config 1,4			TRS.1.1 FDD
	Config 2,5		TRS.1.1 TDD
	Config 3,6		TRS.1.2 TDD
SSB Configuration	Config 1,2,4,5		SSB.1 FR1
	Config 3,6		SSB.2 FR1

Correlation Matrix and Antenna			1x2 Low		
Configuration					
EPRE ratio of PSS to SSS					
EPRE ratio of PBCH DM	RS to SSS				
EPRE ratio of PBCH to F	BCH DMRS				
EPRE ratio of PDCCH D	MRS to SSS				
EPRE ratio of PDCCH to	PDCCH DMRS	1			
EPRE ratio of PDSCH DI	MRS to SSS	dB	0		
EPRE ratio of PDSCH to	PDSCH				
EPRE ratio of OCNG DM	IRS to SSS(Note				
1)					
EPRE ratio of OCNG to 0	OCNG DMRS				
(Note 1)					
Noc <sup>Note 2</sup>		dBm/15	-104		
		kHz	-104		
SS-RSRP Note 3		dBm/15	-87		
		kHz	-01		
Ê <sub>s</sub> /I <sub>ot</sub>		dB	17		
Ês/Noc		dB	17		
Io <sup>Note3</sup>	Config 1,2,4,5	dBm/	-58.96		
	001111g 1,2,1,0	9.36MHz	00.00		
Config 3,6		dBm/	-52.86		
		38.16MHz			
Time offset to Cell1 Note 4		μS	500		
Propagation Condition			AWGN		
			y allocated and a constant total transmitted power		
•	ty is achieved for all	•			
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over					

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for N<sub>∞</sub> to be fulfilled.

Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselvess.

Note 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells

Table A.4.5.2.2.1-4: Void

### A.4.5.2.2.2 Test Requirements

The UE shall be continuously scheduled in NR PSCell during the entire length of T1. UE shall not be scheduled in LTE PCell during T1. During the time duration T1 the UE shall transmit at least 99% of ACK/NACK on NR PSCell.

Interruption on NR PSCell shall not exceed X as defined in Table A.4.5.2.2.2-1.

Table A.4.5.2.2.2-1: Interruption length X at transition between active and non-active during DRX

и	NR Slot	Interruption length X	
7	length (ms)	Async	
0	1	2	
1	0.5	2	

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

## A.4.5.2.3 E-UTRAN – NR FR1 interruptions during measurements on deactivated NR SCC in synchronous EN-DC

### A.4.5.2.3.1 Test Purpose and Environment

The purpose of this test is to verify E-UTRAN PCell and NR PSCell interruptions during the measurement on the deactivated NR SCC, the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for E-UTRAN PCell and NR PSCell in EN-DC specified in TS 38.133 clause 8.2.1.2. Supported test configurations are shown in table A.4.5.2.3.1-1.

The general test parameters and NR cell specific test parameters are given in Table A.4.5.2.3.1-2 and A.4.5.2.3.1-3 below. And the E-UTRAN cell specific test parameters can refer to Table A.3.7.2.1-1. In the test there are three cells: Cell1, Cell2 and Cell3. Cell1 is LTE PCell, Cell2 and Cell3 is NR PSCell and NR deactivated SCell. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE is connected to Cell1 and Cell2. The point in time at which the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated NR SCells is received at the UE antenna connector, defines the start of time period T1. During T1, LTE PCell and NR PSCell are continuously scheduled in DL.

Table A.4.5.2.3.1-1: Interruptions during measurements on deactivated NR SCC supported test configurations

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

Table A.4.5.2.3.1-2: General test parameters for E-UTRAN – NR interruptions during measurements on deactivated NR SCC in synchronous EN-DC

Parameter	Unit	Value	Comment
RF Channel Number		1, 2	One is E-UTRAN RF channel and the
		1, 2	other is NR RF channel
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Active PSCell		Cell2	PSCell on NR RF channel number 2.
Configured deactivated		Cell3	Deactivated SCell on NR RF channel
SCell			number 2.
CP length		Normal	Applicable to Cell1, Cell2 and Cell3
DRX		OFF	
Measurement gap pattern		OFF	
Id		OFF	
SCell measurement cycle	ms	640	
(measCycleSCell)	1115	040	
T1	S	10	

Table A.4.5.2.3.1-3: NR cell specific test parameters for E-UTRAN – NR interruptions during measurements on deactivated NR SCC in synchronous EN-DC

Parameter		Unit	Cell2	Cell3
Frequency Range			FR1	FR1
Duplex mode	Config 1,4		FDD	FDD
	Config 2,3,5,6		TDD	TDD
TDD configuration	Config 1,4		Not Applicable	Not Applicable
	Config 2,5		TDDConf.1.1	TDDConf.1.1
	Config 3,6		TDDConf.2.1	TDDConf.2.1
BW <sub>channel</sub>	Config 1,4		10: N <sub>RB,c</sub> = 52	10: N <sub>RB,c</sub> = 52
	Config 2,5		10: N <sub>RB,c</sub> = 52	10: N <sub>RB,c</sub> = 52
	Config 3,6		40: N <sub>RB,c</sub> = 106	40: N <sub>RB,c</sub> = 106
Initial DL BWP	Config 1,4		DLBWP.0.1	DLBWP.0.1
Configuration	Config 2,5		DLBWP.0.1	DLBWP.0.1
	Config 3,6		DLBWP.0.1	DLBWP.0.1
Dedicated DL BWP	Config 1,4		DLBWP.1.1	DLBWP.1.1
Configuration	Config 2,5		DLBWP.1.1	DLBWP.1.1
	Config 3,6		DLBWP.1.1	DLBWP.1.1
Initial UL BWP	Config 1,4		ULBWP.0.1	ULBWP.0.1
Configuration	Config 2,5		ULBWP.0.1	ULBWP.0.1
	Config 3,6		ULBWP.0.1	ULBWP.0.1
Dedicated UL BWP	Config 1,4		ULBWP.1.1	ULBWP.1.1
Configuration	Config 2,5		ULBWP.1.1	ULBWP.1.1
	Config 3,6		ULBWP.1.1	ULBWP.1.1
PDSCH Reference	Config 1,4		SR.1.1 FDD	-
measurement channel	Config 2,5		SR.1.1 TDD	-
	Config 3,6		SR.2.1 TDD	-
RMSI CORESET	Config 1,4		CR.1.1 FDD	CR.1.1 FDD
parameters	Config 2,5		CR.1.1 TDD	CR.1.1 TDD
	Config 3,6		CR.2.1 TDD	CR.2.1 TDD
PDCCH CORESET	Config 1,4		CCR.1.1 FDD	CCR.1.1 FDD
parameters	Config 2,5		CCR.1.1 TDD	CCR.1.1 TDD
	Config 3,6		CCR.2.1 TDD	CCR.2.1 TDD
TRS configuration	Config 1,4		TRS.1.1 FDD	TRS.1.1 FDD
	Config 2,5		TRS.1.1 TDD	TRS.1.1 TDD
	Config 3,6	1	TRS.1.2 TDD	TRS.1.2 TDD
OCNG Patterns			OP.1	OP.1
SMTC Configuration			SMTC.1	SMTC.1
TCI state			TCI.State.0	TCI.State.0
SSB Configuration	Config 1,2,4,5		SSB.1 FR1	SSB.1 FR1
	Config 3,6		SSB.2 FR1	SSB.2 FR1

Correlation Matrix and	d Antenna		1x2 Low	1x2 Low
Configuration				
EPRE ratio of PSS to	SSS			
EPRE ratio of PBCH	DMRS to SSS			
EPRE ratio of PBCH	to PBCH DMRS			
EPRE ratio of PDCCI	H DMRS to SSS			
EPRE ratio of PDCCI	H to PDCCH DMRS			
EPRE ratio of PDSCH	H DMRS to SSS	dB	0	0
EPRE ratio of PDSCH	H to PDSCH			
EPRE ratio of OCNG	DMRS to SSS(Note			
1)				
EPRE ratio of OCNG	to OCNG DMRS			
(Note 1)		dBm/15		
Noc <sup>Note 2</sup>	N <sub>oc</sub> Note 2		-104	-104
		kHz		
SS-RSRP Note 3		dBm/15	-87	-87
<u> </u>		kHz		
Ê <sub>s</sub> /I <sub>ot</sub>		dB	17	17
Ê <sub>s</sub> /N <sub>oc</sub>		dB	17	17
Io <sup>Note3</sup>	Config 1,2,4,5	dBm/ 9.36MHz	-58.96	-58.96
Config 3,6		dBm/ 38.16MHz	-52.86	-52.86
Time offset to Cell1 Note 4		μS	33	33
Time offset to Cell2 Note 5		μs	-	3
Propagation Condition			AWGN	AWGN
Note 1: OCNG sha	all be used such that bo	oth cells are fully a	illocated and a constant	total transmitted power
spectral de	neity is achieved for al	I OEDM symbols		

- spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for Noc to be fulfilled.
- Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselvess.
- Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and Note 4: slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells
- Note 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.

### A.4.5.2.3.2 **Test Requirements**

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed the value defined in Table A.4.5.2.3.2-1 if the NR PSCell is not in the same band as the deactivated SCell or Table A.4.5.2.3.2-2 if the NR PSCell is in the same band as the deactivated SCell.

Table A.4.5.2.3.2-1: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length
0	1	1
1	0.5	1

Table A.4.5.2.3.2-2: Interruption duration if the NR PSCell is in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length
0	1	1 + SMTC duration
1	0.5	2 + SMTC duration

Each interruption on E-UTRAN PCell shall not exceed 1ms + SMTC duration subframes for intraband EN-DC, 1 subframe for synchronous interband EN-DC.

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

## A.4.5.2.4 E-UTRAN – NR FR1 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

### A.4.5.2.4.1 Test Purpose and Environment

The purpose of this test is to verify E-UTRAN PCell and NR PSCell interruptions during the measurement on the deactivated NR SCC, the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for E-UTRAN PCell and NR PSCell in EN-DC specified in TS 38.133 clause 8.2.1. Supported test configurations are shown in table A.4.5.2.4.1-1.

The general test parameters and NR cell specific test parameters are given in Table A.4.5.2.4.1-2 and A.4.5.2.4.1-3 below. And the E-UTRAN cell specific test parameters can refer to Table A.3.7.2.1-1. In the test there are three cells: Cell1, Cell2 and Cell3. Cell1 is LTE PCell, Cell2 and Cell3 is NR PSCell and NR deactivated SCell. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE is connected to Cell1 and Cell2. The point in time at which the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated NR SCells is received at the UE antenna connector, defines the start of time period T1. During T1, LTE PCell and NR PSCell are continuously scheduled in DL.

Table A.4.5.2.4.1-1: Interruptions during measurements on deactivated NR SCC supported test configurations

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

Table A.4.5.2.4.1-2: General test parameters for E-UTRAN – NR interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

Parameter	Unit	Value	Comment
RF Channel Number		1, 2	One is E-UTRAN RF channel and the
		1, 2	other is NR RF channel
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Configured PSCell		Cell2	PSCell on NR RF channel number 2.
Configured deactivated		Cell3	Deactivated SCell on NR RF channel
SCell			number 2.
CP length		Normal	Applicable to Cell1, Cell2 and Cell3
DRX		OFF	
Measurement gap pattern		OFF	
Id		OFF	
SCell measurement cycle	ms	640	
(measCycleSCell)	1115	040	
T1	S	10	

Table A.4.5.2.4.1-3: NR cell specific test parameters for E-UTRAN – NR interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

Parameter		Unit	Cell2	Cell3
Frequency Range			FR1	FR1
Duplex mode	Config 1,4		FDD	FDD
	Config 2,3,5,6		TDD	TDD
TDD configuration	Config 1,4		Not Applicable	Not Applicable
	Config 2,5		TDDConf.1.1	TDDConf.1.1
	Config 3,6		TDDConf.2.1	TDDConf.2.1
BWchannel	Config 1,4		10: N <sub>RB,c</sub> = 52	10: N <sub>RB,c</sub> = 52
	Config 2,5		10: N <sub>RB,c</sub> = 52	10: N <sub>RB,c</sub> = 52
	Config 3,6		40: N <sub>RB,c</sub> = 106	40: N <sub>RB,c</sub> = 106
Initial BWP	Config 1,4		DLBWP.0.1	DLBWP.0.1
Configuration	Config 2,5		DLBWP.0.1	DLBWP.0.1
	Config 3,6		DLBWP.0.1	DLBWP.0.1
Dedicated DL BWP	Config 1,4		DLBWP.1.1	DLBWP.1.1
Configuration	Config 2,5		DLBWP.1.1	DLBWP.1.1
	Config 3,6		DLBWP.1.1	DLBWP.1.1
Initial UL BWP	Config 1,4		ULBWP.0.1	ULBWP.0.1
Configuration	Config 2,5		ULBWP.0.1	ULBWP.0.1
	Config 3,6		ULBWP.0.1	ULBWP.0.1
Dedicated UL BWP	Config 1,4		ULBWP.1.1	ULBWP.1.1
Configuration	Config 2,5		ULBWP.1.1	ULBWP.1.1
	Config 3,6		ULBWP.1.1	ULBWP.1.1
PDSCH Reference	Config 1,4		SR.1.1 FDD	-
measurement channel	Config 2,5		SR.1.1 TDD	-
	Config 3,6		SR.2.1 TDD	-
RMSI CORESET	Config 1,4		CR.1.1 FDD	CR.1.1 FDD
parameters	Config 2,5		CR.1.1 TDD	CR.1.1 TDD
	Config 3,6		CR.2.1 TDD	CR.2.1 TDD
PDCCH CORESET	Config 1,4		CCR.1.1 FDD	CCR.1.1 FDD
parameters	Config 2,5		CCR.1.1 TDD	CCR.1.1 TDD
	Config 3,6		CCR.2.1 TDD	CCR.2.1 TDD

TRS configuration	Config 1,4		TRS.1.1 FDD	TRS.1.1 FDD
	Config 2,5	<b>1</b>	TRS.1.1 TDD	TRS.1.1 TDD
	Config 3,6		TRS.1.2 TDD	TRS.1.2 TDD
OCNG Patterns			OP.1	OP.1
SSB Configuration	Config 1,2,4,5		SSB.1 FR1	SSB.1 FR1
	Config 3,6	1 [	SSB.2 FR1	SSB.2 FR1
SMTC Configuration			SMTC.1	SMTC.1
TCI state	•		TCI.State.0	TCI.State.0
Correlation Matrix and	Antenna		1x2 Low	1x2 Low
Configuration				
EPRE ratio of PSS to S	SS			
EPRE ratio of PBCH DI	MRS to SSS			
EPRE ratio of PBCH to	PBCH DMRS			
EPRE ratio of PDCCH	DMRS to SSS			0
EPRE ratio of PDCCH	to PDCCH DMRS		0	
EPRE ratio of PDSCH I	DMRS to SSS	dB		
EPRE ratio of PDSCH t	o PDSCH			
EPRE ratio of OCNG D	MRS to SSS(Note			
1)				
EPRE ratio of OCNG to	OCNG DMRS			
(Note 1)				
N <sub>oc</sub> Note 2		dBm/15	-104	-104
		kHz	-104	-104
SS-RSRP Note 3		dBm/15	-87	-87
		kHz		
Ês/Iot		dB	17	17
Ês/Noc		dB	17	17
Io <sup>Note3</sup>	Config 1,2,4,5	dBm/	-58.96	-58.96
	55111g 1,2, 1,0	9.36MHz		00.00
	Config 3,6	dBm/	-52.86	-52.86
		38.16MHz		
Time offset to Cell1 Note 4		ms	3	3
Time offset to Cell2 Note	5	μS	-	3
Propagation Condition			AWGN	AWGN
Note 1: OCNG shall	be used such that be	oth cells are fully	allocated and a constant to	ital transmitted power

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for N<sub>oc</sub> to be fulfilled.
- Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselvess.
- Note 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells
- Note 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.

### A.4.5.2.4.2 Test Requirements

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed the value defined in Table A.4.5.2.4.2-1 and Table A.4.5.2.4.2-2.

Table A.4.5.2.4.2-1: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length
0	1	1
1	0.5	1

Table A.4.5.2.4.2-2: Interruption duration if the NR PSCell is in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length
0	1	1 + SMTC duration
1	0.5	2 + SMTC duration

Each interruption on E-UTRAN PCell shall not exceed 1ms + SMTC duration subframes for synchronous intraband EN-DC, or 2 subframes for asynchronous interband EN-DC.

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

## A.4.5.2.5 E-UTRAN – NR FR1 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC

### A.4.5.2.5.1 Test Purpose and Environment

The purpose of this test is to verify E-UTRAN PCell and NR PSCell interruptions during the measurement on the deactivated E-UTRAN SCC, the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for E-UTRAN PCell and NR PSCell in EN-DC specified in TS38.133 clause 8. 2.1.2. Supported test configurations are shown in table A.4.5.2.5.1-1.

The general test parameters and NR cell specific test parameters are given in Table A.4.5.2.5.1-2 and A.4.5.2.5.1-3 below. And the E-UTRAN cell specific test parameters can refer to Table A.3.7.2.1-1. In the test there are three cells: Cell1, Cell2 and Cell3. Cell1 and Cell3 is E-UTRAN PCell and E-UTRAN deactivated SCell, Cell2 is NR FR1 PSCell. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE is connected to Cell1 and Cell2. The point in time at which the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated E-UTRAN SCells is received at the UE antenna connector, defines the start of time period T1. During T1, LTE PCell and NR PSCell are continuously scheduled in DL.

Table A.4.5.2.5.1-1: Interruptions during measurements on deactivated E-UTRAN SCC supported test configurations

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

Table A.4.5.2.5.1-2: General test parameters for E-UTRAN – NR interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC

Parameter	Unit	Value	Comment
RF Channel Number		1, 2	One is E-UTRAN RF channel and the
		1, 2	other is NR RF channel
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Active PSCell		Cell2	PSCell on NR RF channel number 2.
Configured deactivated		Cell3	Deactivated SCell on E-UTRAN RF
SCell			channel number 1.
CP length		Normal	Applicable to Cell1, Cell2 and Cell3
DRX		OFF	
Measurement gap pattern		OFF	
Id		OFF	
SCell measurement cycle	ms	640	
(measCycleSCell)	1115	040	
T1	S	10	

Table A.4.5.2.5.1-3: NR cell specific test parameters for E-UTRAN – NR interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC

Parame	ter	Unit	Cell2
Frequency Range			FR1
Duplex mode	Config 1,4		FDD
	Config 2,3,5,6		TDD
TDD configuration	Config 1,4		Not Applicable
	Config 2,5		TDDConf.1.1
	Config 3,6		TDDConf.2.1
BW <sub>channel</sub>	Config 1,4	MHz	10: N <sub>RB,c</sub> = 52
	Config 2,5		10: N <sub>RB,c</sub> = 52
	Config 3,6		40: N <sub>RB,c</sub> = 106
Initial DL BWP	Config 1,4		DLBWP.0.1
Configuration	Config 2,5		DLBWP.0.1
	Config 3,6		DLBWP.0.1
Dedicated DL BWP	Config 1,4		DLBWP.1.1
Configuration	Config 2,5		DLBWP.1.1
	Config 3,6		DLBWP.1.1
Initial UL BWP	Config 1,4		ULBWP.0.1
Configuration	Config 2,5		ULBWP.0.1
	Config 3,6		ULBWP.0.1
Dedicated UL BWP	Config 1,4		ULBWP.1.1
Configuration	Config 2,5		ULBWP.1.1
	Config 3,6		ULBWP.1.1
PDSCH Reference	Config 1,4		SR.1.1 FDD
measurement channel	Config 2,5		SR.1.1 TDD
	Config 3,6		SR.2.1 TDD
RMSI CORESET	Config 1,4		CR.1.1 FDD
parameters	Config 2,5		CR.1.1 TDD
	Config 3,6		CR.2.1 TDD
PDCCH CORESET	Config 1,4		CCR.1.1 FDD
parameters	Config 2,5		CCR.1.1 TDD
	Config 3,6		CCR.2.1 TDD

TRS configuration	Config 1,4		TRS.1.1 FDD	
113 configuration	Config 2,5	╡	TRS.1.1 TDD	
		-		
0010 5 "	Config 3,6		TRS.1.2 TDD	
OCNG Patterns			OP.1	
SMTC Configuration			SMTC.1	
TCI state			TCI.State.0	
SSB Configuration	Config 1,2,4,5		SSB.1 FR1	
	Config 3,6		SSB.2 FR1	
Correlation Matrix and Ar	ntenna		1x2 Low	
Configuration				
EPRE ratio of PSS to SS	S			
EPRE ratio of PBCH DM	RS to SSS	1		
EPRE ratio of PBCH to P	BCH DMRS	1		
EPRE ratio of PDCCH D	MRS to SSS			
EPRE ratio of PDCCH to				
EPRE ratio of PDSCH DI		dB	0	
EPRE ratio of PDSCH to		1		
EPRE ratio of OCNG DM		-		
1)				
EPRE ratio of OCNG to 0	OCNG DMRS	-		
(Note 1)	30110 Biiii 10			
N <sub>oc</sub> Note 2		dBm/15		
1400		kHz	-104	
SS-RSRP Note 3		dBm/15		
		kHz	-87	
Ê <sub>s</sub> /I <sub>ot</sub>		dB	17	
Ês/Noc		dB	17	
Io <sup>Note3</sup>		dBm/		
	Config 1,2,4,5	9.36MHz	-58.96	
		dBm/		
	Config 3,6	38.16MHz	-52.86	
Time offset to Cell1 Note 4			33	
		μS	AWGN	
Propagation Condition  Note 1: OCNG shall be used such that both		th colle are fully	r allocated and a constant total transmitted power	
		•	·	
spectral density is achieved for all OFDM				
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over				

- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for N₀c to be fulfilled.
- Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselvess.
- Note 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells

### A.4.5.2.5.2 Test Requirements

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed X defined in Table A.4.5.2.5.2-1 if the NR PSCell is not in the same band as the E-UTRAN deactivated SCell or Y in Table A.4.5.2.3.2-1 if the NR PSCell is in the same band as the E-UTRAN deactivated SCell.

Table A.4.5.2.5.2-1: Interruption length X and Y at measurements on deactivated E-UTRA SCC

μ	NR Slot	Interruption length X slot	Interruption length Y slot
<i>,</i> , , , , , , , , , , , , , , , , , ,	length (ms)	Sync	
0	1	1	1
1	0.5	1	1

Each interruption on E-UTRAN PCell shall not exceed 1 subframe if the PCell is not in the same band as the deactivated SCell, or 5 subframes if the PCell is in the same band as the deactivated SCell.

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

# A.4.5.2.6 E-UTRAN – NR FR1 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC

### A.4.5.2.6.1 Test Purpose and Environment

The purpose of this test is to verify E-UTRAN PCell and NR PSCell interruptions during the measurement on the deactivated NR SCC, the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for E-UTRAN PCell and NR PSCell in EN-DC specified in TS 38.133 clause 8.2.1. Supported test configurations are shown in table A.4.5.2.6.1-1.

The general test parameters and NR cell specific test parameters are given in Table A.4.5.2.6.1-1 and A.4.5.2.6.1-2 below. And the E-UTRAN cell specific test parameters can refer to Table A.3.7.2.1-1. In the test there are three cells: Cell1, Cell2 and Cell3. Cell1 and Cell3 is E-UTRAN PCell and E-UTRAN deactivated SCell, Cell2 is NR FR1 PSCell. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE is connected to Cell1 and Cell2. The point in time at which the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated NR SCells is received at the UE antenna connector, defines the start of time period T1. During T1, LTE PCell and NR PSCell are continuously scheduled in DL.

Table A.4.5.2.6.1-1: Interruptions during measurements on deactivated E-UTRAN SCC supported test configurations

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

Table A.4.5.2.6.1-2: General test parameters for E-UTRAN – NR interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC

Parameter	Unit	Value	Comment
RF Channel Number		1, 2	One is E-UTRAN RF channel and two is
		1, 2	NR RF channel
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Configured PSCell		Cell2	PSCell on NR RF channel number 2.
Configured deactivated		Cell3	Deactivated SCell on E-UTRAN RF
SCell			channel number 1.
CP length		Normal	Applicable to Cell1, Cell2 and Cell3
DRX		OFF	
Measurement gap pattern		OFF	
ld		OFF	
SCell measurement cycle	ms	640	
(measCycleSCell)	1115	040	
T1	S	10	

Table A.4.5.2.6.1-3: NR cell specific test parameters for E-UTRAN – NR interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC

Parame	ter	Unit	Cell2
Frequency Range			FR1
Duplex mode	Config 1,4		FDD
	Config 2,3,5,6	1	TDD
TDD configuration	Config 1,4		Not Applicable
	Config 2,5	]	TDDConf.1.1
	Config 3,6	]	TDDConf.2.1
BW <sub>channel</sub>	Config 1,4		10: N <sub>RB,c</sub> = 52
	Config 2,5	]	10: N <sub>RB,c</sub> = 52
	Config 3,6	]	40: N <sub>RB,c</sub> = 106
Initial DL BWP	Config 1,4		DLBWP.0.1
Configuration	Config 2,5	]	DLBWP.0.1
	Config 3,6	]	DLBWP.0.1
Dedicated DL BWP	Config 1,4		DLBWP.1.1
Configuration	Config 2,5		DLBWP.1.1
	Config 3,6		DLBWP.1.1
Initial UL BWP	Config 1,4		ULBWP.0.1
Configuration	Config 2,5		ULBWP.0.1
	Config 3,6		ULBWP.0.1
Dedicated UL BWP	Config 1,4		ULBWP.1.1
Configuration	Config 2,5		ULBWP.1.1
	Config 3,6		ULBWP.1.1
PDSCH Reference	Config 1,4		SR.1.1 FDD
measurement channel	Config 2,5		SR.1.1 TDD
	Config 3,6		SR.2.1 TDD
RMSI CORESET	Config 1,4		CR.1.1 FDD
parameters	Config 2,5		CR.1.1 TDD
	Config 3,6	<u> </u>	CR.2.1 TDD
PDCCH CORESET	Config 1,4		CCR.1.1 FDD
parameters	Config 2,5		CCR.1.1 TDD
	Config 3,6		CCR.2.1 TDD

TRS configuration	Config 1,4		TRS.1.1 FDD		
	Config 2,5		TRS.1.1 TDD		
	Config 3,6		TRS.1.2 TDD		
OCNG Patterns	1		OP.1		
SMTC Configuration			SMTC.1		
TCI state			TCI.State.0		
SSB Configuration	Config 1,2,4,5		SSB.1 FR1		
	Config 3,6		SSB.2 FR1		
Correlation Matrix and A	ntenna		1x2 Low		
Configuration					
EPRE ratio of PSS to S	SS				
EPRE ratio of PBCH DN	MRS to SSS				
EPRE ratio of PBCH to	PBCH DMRS				
EPRE ratio of PDCCH [	MRS to SSS				
EPRE ratio of PDCCH to	PDCCH DMRS				
EPRE ratio of PDSCH D	MRS to SSS	dB	0		
EPRE ratio of PDSCH to	EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DI	EPRE ratio of OCNG DMRS to SSS(Note				
1)	•				
EPRE ratio of OCNG to	OCNG DMRS				
(Note 1)					
N <sub>oc</sub> Note 2		dBm/15	-104		
		kHz	-104		
SS-RSRP Note 3		dBm/15	-87		
		kHz	-07		
Ê <sub>s</sub> /I <sub>ot</sub>		dB	17		
Ê <sub>s</sub> /N <sub>oc</sub>		dB	17		
Io <sup>Note3</sup>	Config 1 2 4 5	dBm/	-58.96		
	Config 1,2,4,5		-30.90		
Config 3,6		dBm/	-52.86		
		38.16MHz	-32.00		
Time offset to Cell1 Note 4		μS	500		
Propagation Condition			AWGN		
Note 1: OCNG shall be	Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power				
spectral dens	ity is achieved for al	l OFDM symbo	ls.		
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over					

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for N<sub>oc</sub> to be fulfilled.

Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselvess.

Note 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells

### A.4.5.2.6.2 Test Requirements

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on E-UTRAN PCell and NR PSCell. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed the value defined in Table A.4.5.2.4.2-1 and Table A.4.5.2.4.2-2.

## Table A.4.5.2.6.2-1: Interruption duration if the NR PSCell is not in the same band as the E-UTRAN deactivated SCell

μ	NR Slot length (ms)	Interruption length
0	1	1
1	0.5	1

Table A.4.5.2.6.2-2: Interruption duration if the NR PSCell is in the same band as the E-UTRAN deactivated SCell

μ	NR Slot length (ms)	Interruption length		
0	1	1 + SMTC duration		
1	0.5	2 + SMTC duration		

Each interruption on E-UTRAN PCell shall not exceed 1 subframe if the PCell is not in the same band as the deactivated SCell, or 5 subframes if the PCell is in the same band as the deactivated SCell.

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

### A.4.5.2.7 Void

### A.4.5.3 SCell Activation and Deactivation Delay

## A.4.5.3.1 SCell Activation and deactivation of known SCell in FR1 for 160ms SCell measurement cycle

### A.4.5.3.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SCell activation and deactivation times are within the requirements stated in clause 8.3, when the SCell in FR1 is known by the UE at the time of activation.

The supported test configurations are shown in table A.4.5.3.1.1-1 below. The test parameters are given in Tables A.4.5.3.1.1-2 and cell-specific parameters in A.4.5.3.1.1-3 below. The test consists of three successive time periods, with duration of T1, T2 and T3, respectively. There are three carriers, E-UTRA has one cell, NR has two cells. All cells have constant signal levels throughout the test. Before the test starts the UE is connected to Cell 1 (PCell) on E-UTRA and Cell 2 (PSCell) on NR, but is not aware of Cell 3 (SCell) on NR. The UE is monitoring the PCell and PSCell. The UE shall be continuously scheduled in the PCell and PSCell throughout the whole test.

At the beginning of T1 the UE receives an RRC message by which the SCell (Cell 3) becomes configured on NR. The UE now starts monitoring the SCell. The test equipment sends a MAC message for activation of the SCell.

The point in time at which the MAC message is received at the UE antenna connector, in a slot # denoted m, defines the start of time period T2. The UE shall be able to report valid CSI in PSCell for the activated SCell at latest in slot  $(m+T_{HARQ}+T_{activation\_time}+T_{CSI\_Reporting})$ , as defined in clause 8.3. The UE shall start reporting CSI in PSCell in slot (m+k) and shall report CQI index 0 (out-of-range) until the SCell activation has been completed. Any PCell or PSCell interruption due to activation of SCell shall occur in the slot  $(m+1+[T_{HARQ}+3ms+T_{SMTC\_MAX}+T_{SMTC\_duration}])$ , as defined in clause 8.3.

Time period T3 starts when a MAC message for deactivation of SCell, sent from the test equipment to the UE in a slot # denoted n, is received at the UE antenna connector. The UE shall carry out deactivation of the SCell in a slot  $(n+[T_{HARQ}+3ms])$ , as defined in clause 8.3, and any PCell and PSCell interruption due to the deactivation shall occur in the slot  $(n+1+[T_{HARQ}+3ms])$ , as defined in clause 8.3.

The test equipment verifies that potential interruption is carried out in the correct time span by monitoring ACK/NACK sent in PSCell during activation and deactivation of SCell, respectively.

The test equipment verifies the activation time by counting the slots from the time when the SCell activation command is sent until a CSI report with other than CQI index 0 is received.

The test equipment verifies the deactivation time by counting the slots from the time when the SCell deactivation command is sent until CSI reporting for SCell is discontinued.

Table A.4.5.3.1.1-1: known FR1 SCell activation in non-DRX for 160ms SCell measurement cycle supported test configurations

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

Table A.4.5.3.1.1-2: General test parameters for known FR1 SCell activation case, 160ms SCell measurement cycle

Parameter	Unit	Value	Comment
RF Channel Number		1,2,3	One E-UTRAN radio channel (1) and two NR radio channel (2,3) are used for this test
Active PCell		Cell 1	Primary cell on E-UTRAN RF channel number 1. As specified in clause A.3.7.2.1
Active PSCell		Cell 2	Primary secondary cell on NR RF channel number 2.
Configured deactivated SCell		Cell 3	Configured deactivated secondary cell on NR RF channel number 3
CP length		Normal	
DRX		OFF	Continuous monitoring of primary cell
CQI/PMI periodicity and offset configuration index		0	CQI reporting for SCell every second subframe
Cell-individual offset for cells on E-UTRA RF channel number	dB	0	Individual offset for cells on primary component carrier.
Cell-individual offset for cells on NR channel number	dB	0	Individual offset for cells on secondary component carrier.
SCell measurement cycle (measCycleSCell)	ms	160	
Cell3 timing offset to cell2	μS	0	
Time alignment error between cell3 and cell2	μs	≤ Time alignment error as specified in TS 38.104 [13] clause 6.5.3.1.	The value of time alignment error depends upon the type of carrier aggregation.
T1	s	7	During this time the PSCell shall be known and the SCell configured and detected.
T2	S	1	During this time the UE shall activate the SCell.
ТЗ	s	1	During this time the UE shall deactivate the SCell.

THARQ	slot	k	k is a number of slots indicated by the PDSCH-to-HARQ_feedback timing indicator field in a corresponding DCI format or provided by <i>dl-DataToUL-ACK</i> if the PDSCH-to-HARQ feedback timing field is not present in the DCI format, the value is defined in 38.213 [3]
T <sub>CSI_Reporting</sub>	ms	2	the delay uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [2]
k	ms	$k_1 + 3 \cdot N_{\text{slot}}^{\text{subframe}\mu} + 1$	As specified in clause 4.3 of TS 38.213 [3]

Table A. 4.5.3.1.1-3: Cell specific test parameters for known FR1 SCell activation case, 160ms SCell measurement cycle

Parameter		l lmi4		Cell 2			Cell 3	
Parame	ter	Unit	T1 T2 T3		T1	T2	Т3	
SSB ARFCN				freq1			freq2	
Duplex mode	Config 1,4		FDD					
Duplex mode	Config 2,3,5,6				TE	DD		
	Config 1,4				Not Ap	plicable		
TDD configuration	Config 2,5				TDDC	onf.1.1		
	Config 3,6		TDDConf.2.1					
	Config 1,4				10: N <sub>RI</sub>	<sub>B,c</sub> = 52		
BWchannel	Config 2,5	MHz			10: N <sub>R</sub>	<sub>B,c</sub> = 52		
	Config 3,6				40: N <sub>RB</sub>	,c = 106		
DL initial BWP	Config 1, 2, 3, 4,				D. D.	/D 0 4		
configuration 5, 6					DLBV	/P.0.1		
DL dedicated BWP	Config 1, 2, 3, 4,		DLBWP.1.1					
configuration UL initial BWP	5, 6 Config 1, 2, 3, 4,							
configuration	5, 6		ULBWP.0.1					
UL dedicated BWP	Config 1, 2, 3, 4,					/D 4 4		
configuration	5, 6		ULBWP.1.1					
DRx Cycle		ms	Not Applicable					
DD00HD (	Config 1,4		(	SR.1.1 FDI	)		SR.1.1 FDE	)
PDSCH Reference	Config 2,5			SR.1.1 TDI	)		SR.1.1 TDE	)
measurement channel	Config 3,6			SR.2.1 TDI	)		SR.2.1 TDE	)
DMCI CODECET	Config 1,4		(	CR.1.1 FDI	)		CR.1.1 FDE	)
RMSI CORESET Reference Channel	Config 2,5		(	CR.1.1 TDI	)		CR.1.1 TDE	)
Reference Channel	Config 3,6		(	CR.2.1 TDI	)		CR.2.1 TDE	)
DMO CODECET	Config 1,4		С	CR.1.1 FD	D	(	CCR.1.1 FD	D
RMC CORESET	Config 2,5		С	CR.1.1 TD	D	(	CCR.1.1 TD	D
Reference Channel	Config 3,6		С	CR.2.1 TD	D	(	CCR.2.1 TD	D
	Config 1,4		TI	RS.1.1 FE	)D	Т	RS.1.1 FD	D
TRS configuration	Config 2,5		TI	RS.1.1 TE	)D	Т	RS.1.1 TD	D
-	Config 3,6		TI	RS.1.2 TE	)D	Т	RS.1.2 TD	D
OCNG Patterns		OP.1						
SMTC configuration		SMTC.1						
SSB configuration	Config 1,2,4,5		SSB.1 FR1					

	Config 3,6		SSB.2 FR1	
PDSCH/PDCCH	Config 1,2,4,5	- kHz	15 kHz	
subcarrier spacing	er spacing Config 3,6		30kHz	
EPRE ratio of PSS to SSS	-			
EPRE ratio of PBCH DMRS	S to SSS			
EPRE ratio of PBCH to PBC	CH DMRS			
EPRE ratio of PDCCH DMF	RS to SSS			
EPRE ratio of PDCCH to PI	DCCH DMRS	dB	0	
EPRE ratio of PDSCH DMF	RS to SSS			
EPRE ratio of PDSCH to PI	DSCH			
EPRE ratio of OCNG DMRS	\ /			
EPRE ratio of OCNG to OC	NG DMRS (Note 1)			
$N_{oc}^{ m Note2}$	$N_{oc}^{$		-104	
$N_{oc}^{$	Config 1,2,4,5		-104	
IV <sub>oc</sub>	Config 3,6	dBm/SCS	-101	
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$		dB	17	
$\hat{E}_s/N_{oc}$		dB	17	
CC DCDDNote3	Config 1,2,4,5	-ID/000	-87	
SS-RSRP <sup>Note3</sup>	Config 3,6	dBm/SCS	-84	
SCH RP Note 3		dBm/15 kHz	-87	
Propagation condition		-	AWGN	
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectra				
	ieved for all OFDM	•	and and a constant total dialonnities porter opposition	

- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.
- SS-RSRP and SCH RP levels have been derived from other parameters for information purposes. They Note 3: are not settable parameters themselves.
- The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.] Note 4:

#### A.4.5.3.1.2 Test Requirements

During T2 the UE shall send the first CSI report for SCell in slot (m+k), or in slot (m+1+[T<sub>HARQ</sub>+3ms+T<sub>SSB max</sub>+T<sub>SMTC duration</sub>]+1) as defined in clause 8.3 if slot (m+k) was subject to interruption. Whether CSI report in slot (m+k) was interrupted is checked by monitoring ACK/NACK sent in PCell in slot (m+k).

During T2 the UE shall start sending CSI reports for SCell with non-zero CQI index at latest in a slot  $(m+T_{HARO}+T_{activation\ time}+T_{CSI\ Reporting})$ ,  $T_{activation\ time}=[T_{SMTC\ SCell}+5ms]$ , as defined in clause 8.3.

During T3 the UE shall stop sending CSI reports for SCell at latest in a slot (n+[T<sub>HARO</sub>+3ms]), as defined in clause

During T2 interruption of PCell / PSCell during SCell activation shall not happen outside the slot (m+1+[T<sub>HARO</sub>]) to (m+1+[T<sub>HARQ</sub>+3ms+T<sub>SMTC max</sub>+T<sub>SMTC duration</sub>]), as defined in clause 8.3.

During T3 interruption of PCell / PSCell during SCell deactivation shall not happen outside the slot (n+1+[T<sub>HARO</sub>]) to  $(n+1+[T_{HARO}+3ms])$ , as defined in clause 8.3.

The interruption of PSCell shall not be more than the values specified for EN-DC in Clause 8.2.1.2.4.

All of the above test requirements shall be fulfilled in order for the observed SCell activation delay and SCell deactivation delay to be counted as correct. The rate of correct observed SCell activation delay and SCell deactivation delay during repeated tests shall be at least 90%.

NOTE: During T2 if there are no uplink resources for reporting the valid CSI in a slot (m+T<sub>HARQ</sub>+T<sub>activation\_time</sub>+T<sub>CSI\_Reporting</sub>) as defined in clause 8.3 then the UE shall use the next available uplink resource for reporting the corresponding valid CSI.

# A.4.5.3.2 SCell Activation and deactivation of known SCell in FR1 for 320 ms SCell measurement cycle

### A.4.5.3.2.1 Test Purpose and Environment

The purpose of this test case is the same as for the test defined in clause A.4.5.3.1.1. The supported test configurations are the same as defined in clause A.4.5.3.1.1. The test parameters are the same except those described in the following clause. The listed parameter values in Tables A.4.5.3.2.1-1 will replace the values of corresponding parameters in Tables A.4.5.3.1.1-2.

Table A.4.5.3.2.1-1: General test parameters for known FR1 SCell activation case, 320 ms SCell measurement cycle

Parameter	Unit	Value	Comment
SCell measurement cycle (measCycleSCell)	ms	320	

### A.4.5.3.2.2 Test Requirements

The test requirements defined in clause A.4.5.3.1.2 shall apply to this test case, except  $T_{activation\_time}$  will be replaced with the value [ $T_{SMTC}$  MAX+ $T_{SMTC}$  SCell+5ms].

### A.4.5.3.3 SCell Activation and deactivation of unknown SCell in FR1

### A.4.5.3.3.1 Test Purpose and Environment

The purpose of this test is to verify that the SCell activation and deactivation times are within the requirements stated in clause 8.3, when the SCell in FR1 is unknown by the UE at the time of activation.

The supported test configurations are the same as defined in clause A.4.5.3.1.1. The test parameters are the same except those described in the following clause. The listed parameter values in Tables A.4.5.3.3.1-1 will replace the values of corresponding parameters in Tables A.4.5.3.1.1-2. The test consists of three successive time periods, with duration of T1, T2 and T3, respectively. There are three carriers, E-UTRA has one cell, NR has two cells. Cell 1 and Cell 2 have constant signal levels throughout the test. Before the test starts the UE is connected to Cell 1 (PCell) on E-UTRAN and Cell 2 (PSCell) on NR, but is not aware of Cell 3 (SCell) on NR. The UE is monitoring the PCell and PSCell. The UE shall be continuously scheduled in the PCell and PSCell throughout the whole test.

At the beginning of T1 the UE receives an RRC message by which the SCell (Cell 3) becomes configured on NR. During T1 the SCell is powered off and UE is not aware of SCell.

A MAC message for activation of SCell is sent by the test equipment [100ms] after the RRC message, in a slot # denoted m. The point in time at which the MAC message for activation of SCell is received at the UE antenna connector defines the start of time period T2. Immediately at beginning of T2 the transmission power of cell 3 is increased to same level as for cell 2. The UE shall be able to report valid CSI for the activated SCell at latest in slot (m+T<sub>HARQ</sub>+T<sub>activation\_time</sub>+T<sub>CSI\_Reporting</sub>) as defined in clause 8.3 provided the SCell can be successfully detected on the first attempt. The UE shall start reporting CSI in slot (m+k) and shall report CQI index 0 (out-of-range) until the SCell activation has been completed. Any PCell interruption due to activation of SCell shall occur in the slot (m+1+[T<sub>HARQ</sub>]) to (m+1+[T<sub>HARQ</sub>+3ms+T<sub>SMTC\_MAX</sub>+T<sub>SMTC\_duration]</sub>) as defined in clause 8.3.

Time period T3 starts when a MAC message for deactivation of the SCell, sent from the test equipment to the UE in a slot # denoted n, is received at the UE antenna connector. The UE shall carry out deactivation of the SCell at latest in slot  $(n+[T_{HARQ}+3ms])$  as defined in clause 8.3, and any PCell and PSCell interruption due to the deactivation shall occur in the  $(n+1+[T_{HARQ})]$  to  $(n+1+[T_{HARQ}+3ms])$  as defined in clause 8.3.

The test equipment verifies that potential interruption is carried out in the correct time span by monitoring ACK/NACK sent in PSCell during activation of SCell, respectively.

The test equipment verifies the activation time by counting the slots from the time when the SCell activation command is sent until a CSI report with other than CQI index 0 is received.

The test equipment verifies the deactivation time by counting the slots from the time when the SCell1 deactivation command is sent until CSI reporting for SCell1 is discontinued.

Table A.4.5.3.3.1-1: General test parameters for unknown FR1 SCell activation case, 160ms SCell measurement cycle

Parameter	Unit	Value	Comment
T1	ms	100	During this time the PSCell shall be known and the SCell configured, but not detected.

### A.4.5.3.3.2 Test Requirements

The test requirements defined in clause A.4.5.3.1.2 shall apply to this test case, except  $T_{activation\_time}$  will be replaced with the value  $[2*T_{SMTC\_MAX}+2*T_{SMTC\_SCell}+5ms]$  as defined in clause 8.3.

### A.4.5.4 UE UL carrier RRC reconfiguration Delay

### A.4.5.4.1 UE UL carrier RRC reconfiguration Delay

### Table A.4.5.4.1-1 - Table A.4.5.4.1-4: Void

### A.4.5.4.1.1 Test Purpose and Environment

The purpose of this test is to verify that when the UE receives a RRC message implying NR UL or Supplementary UL carrier configuration, the UE shall be ready to start transmission on the newly configured carrier within the time limits specified in clause 8.4.2 and 8.4.3 for configuring and deconfiguring, respectively.

There are three cells: E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and FR1 SCell (Cell 3). For SCell, both NR uplink and supplementary uplink are broadcast by *ServingCellConfigCommonSIB*. The test parameters for PSCell and SCell are given in Table A. 4.5.4.1.1-1, Table A. 4.5.4.1.1-2, Table A. 4.5.4.1.1-3 and Table A. 4.5.4.1.1-4 below. The test parameters and applicability for E-UTRAN PCell are defined in A.3.7.2. The test consists two tests. In test 1, the test consists of three time periods, with duration of T1, T2 and T3 respectively. During time duration T1, NR uplink of cell 3 is configured to UE. At the start of T2, a supplementary uplink of cell3 is configured to UE through *RRCReconfiguration*, then UE shall start transmission both on the NR uplink and supplementary uplink. At the start of T3, the supplementary uplink is released through *RRCReconfiguration*.

In test 2, the test consists of three time periods, with duration of T1, T2 and T3 respectively. During time duration T1, supplementray uplink on cell 3 is configured to UE. At the start of T2, a NR uplink is configured to UE through *RRCReconfiguration*, then UE shall start transmission both on the NR uplink and supplementary uplink. At the start of T3, the NR uplink is released through *RRCReconfiguration*.

Table A.4.5.4.1.1-1: Supported test configurations

Configuration	PSCell (Cell2)	SCell (Cell3)
1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex	DL and UL: 15kHz SSB SCS, 10 MHz bandwidth,
	mode	FDD duplex mode;
		SUL: 15kHz SCS, 10 MHz bandwidth, SUL duplex
		mode
2	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex	DL and UL: 15kHz SSB SCS, 10 MHz bandwidth,
	mode	TDD duplex mode;
		SUL: 15kHz SCS, 10 MHz bandwidth, SUL duplex
		mode

DD duplex mode; UL: 30kHz SCS, 40 MHz bandwidth, SUL duplex ode
L and UL: 15kHz SSB SCS, 10 MHz bandwidth, DD duplex mode; UL: 15kHz SCS, 10 MHz bandwidth, SUL duplex lode
L and UL: 15kHz SSB SCS, 10 MHz bandwidth, DD duplex mode; UL: 15kHz SCS, 10 MHz bandwidth, SUL duplex lode
L and UL: 30kHz SSB SCS, 40 MHz bandwidth, DD duplex mode; UL: 30kHz SCS, 40 MHz bandwidth, SUL duplex lode
L and UL: 15kHz SSB SCS, 10 MHz bandwidth, DD duplex mode; UL: 15kHz SCS, 10 MHz bandwidth, SUL duplex lode
L and UL: 15kHz SSB SCS, 10 MHz bandwidth, DD duplex mode; UL: 15kHz SCS, 10 MHz bandwidth, SUL duplex ode
L and UL: 30kHz SSB SCS, 40 MHz bandwidth, DD duplex mode; UL: 30kHz SCS, 40 MHz bandwidth, SUL duplex ode configurations

Table A.4.5.4.1.1-2: General test parameters for EN-DC UE UL carrier RRC reconfiguration Delay

Parameter	Unit	Test	Value	Comment
		configuration		
RF Channel		Config 1,2,3, 4,	1, 2, 3	Three radio channels are used for
Number		5, 6, 7, 8, 9	1, 2, 0	these two tests.
Active cell		Config 1,2,3, 4,	Cell 1: E-UTRAN	E-UTRAN PCell on RF channel
		5, 6, 7, 8, 9	PCell	number 1
			Cell 2: FR1 PSCell	FR1 PSCell on RF channel number 2
			Cell 3: FR1 SCell	FR1 SCell on RF channel number 3
CP length		Config 1,2,3, 4,	Normal	
		5, 6, 7, 8, 9		
DRX		Config 1,2,3, 4,	OFF	
		5, 6, 7, 8, 9	OFF	
Measurement		Config 1,2,3, 4,	OFF	
gap pattern Id		5, 6, 7, 8, 9	OFF	
Filter coefficient		Config 1,2,3, 4,	0	L3 filtering is not used
		5, 6, 7, 8, 9		
T1		Config 1,2,3, 4,	5	
	S	5, 6, 7, 8, 9		
T2		Config 1,2,3, 4,	5	
	S	5, 6, 7, 8, 9		
T3		Config 1,2,3, 4,	5	
	S	5, 6, 7, 8, 9		

Table A.4.5.4.1.1-3: NR Cell specific test parameters for EN-DC UE UL carrier RRC reconfiguration Delay on PSCell (Cell 2)

Parameter Unit Test 1 Test 2
------------------------------

		Test Configuration	T1	T2	Т3	T1	T2	Т3
Channel number		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	2				2	
		Conf 1, 2, 3	N/A N/A					
TDD configuration		Conf 4, 5, 6	-	TDD Conf.1	1	TDD Conf.1.1		1
1 DD cornigaration		Conf 7, 8, 9	TDD Conf.2.1		TDD Conf.2.1			
		Conf 1, 2, 3		10: N <sub>RB,c</sub> = 5			0: N <sub>RB,c</sub> = 5	
BW <sub>channel</sub>	MHz	Conf 4, 5, 6		10: $N_{RB,c} = 5$			$10: N_{RB,c} = 5$	
DVVCIIallilei	1411 12	Conf 7, 8, 9	4	0: $N_{RB,c} = 1$	06		0: $N_{RB,c} = 10$	
PDSCH reference		Conf 1, 2, 3		SR.1.1 FDI			SR.1.1 FDD	
measurement		Conf 4, 5, 6		SR.1.1 TDI			SR.1.1 TDD	
channel as defined		Conf 7, 8, 9						
in A.3.1.1		, . , . ,		SR 2.1 TDI	)		SR 2.1 TDD	)
RMSI CORESET		Conf 1, 2, 3		CR.1.1 FDI	)		CR.1.1 FDD	)
reference		Conf 4, 5, 6		CR.1.1 TDI			CR.1.1 TDD	
measurement		Conf 7, 8, 9						
channel as defined in A.3.1.2				CR.2.1 TDI	)		CR.2.1 TDD	)
RMC CORESET		Conf 1, 2, 3	(	CCR.1.1 FD	D	(	CCR.1.1 FDI	D
reference		Conf 4, 5, 6		CCR.1.1 TD			CCR.1.1 TDI	
measurement		Conf 7, 8, 9		3011.1.1 TE		`	JOIN. 1.1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
channel as defined in A.3.1.3		001117, 0, 0	CCR.2.1 TDD		D CCR.2.1 TDD		D	
OCNG Pattern Note 1		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	OP.1			OP.1		
SSB configuration		Conf 1, 2, 3, 4, 5, 6	SSB.1 FR1		SSB.1 FR1 SSB.1 I		SSB.1 FR1	
33b configuration		Conf 7, 8, 9	SSB.2 FR1		SSB.2 FR1			
SMTC configuration		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	SMTC.1				SMTC.1	
DL initial BWP configuration		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	DLBWP.0.1			DLBWP.0.1		
DL dedicated BWP		Conf 1, 2, 3, 4,		DLBWP.1.	1.1 DLBWP.1.1			
configuration UL dedicated BWP		5, 6, 7, 8, 9						
configuration		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9		ULBWP.1.	1	ULBWP.1.1		
EPRE ratio of PSS to SSS								
EPRE ratio of PBCH_DMRS to SSS								
EPRE ratio of PBCH	-							
to PBCH_DMRS	-							
EPRE ratio of								
PDCCH_DMRS to SSS								
	-	Conf 1 2 2 4						
EPRE ratio of PDCCH to	dB	Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	0			0		
PDCCH to		3, 0, 7, 0, 8						
EPRE ratio of	-							
PDSCH_DMRS to								
SSS EDDE ratio of	-							
EPRE ratio of PDSCH to								
PDSCH DMRS								
באואות"ו ואפת ו	4					İ		
EDDE ratio of		1						
EPRE ratio of OCNG DMRS to								

EPRE ratio of OCNG to OCNG DMRS								
	dBm / 15kHz	Conf 1, 2, 3, 4, 5, 6, 7, 8, 9		-102			-102	
$N_{oc}$ Note 2	dBm/	Conf 1,2,3,4,5,6		-102		-102		
	SCS	Conf 7,8,9		-99			-99	
$\hat{E}_s/N_{oc}$	dB	Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	16	16	16	16	16	16
$\hat{E}_{_{s}}/I_{_{ot}}$ Note 3	dB	Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	16	16	16	16	16	16
SS-RSRP Note 3	dBm/ SCS	Conf 1,2,3,4,5,6	-86	-86	-86	-86	-86	-86
	303	Conf 7,8,9	-83	-83	-83	-83	-83	-83
	dBm/ 9.36 MHz	Conf 1,2,3,4,5,6	-57.9	-57.9	-57.9	-57.9	-57.9	-57.9
Io Note 3	dBm/ 38.16 MHz	Conf 7,8,9	-51.8	-51.8	-51.8	-51.8	-51.8	-51.8
Propagation Condition		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9		AWGN			AWGN	
Antenna configuration		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9		1 x 2			1 x 2	

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

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

NOTE 3:  $\hat{E}_{_{\rm s}}/I_{_{\rm ot}}$ , lo, and SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table A.4.5.4.1.1-4: NR Cell specific test parameters for EN-DC UE UL carrier RRC reconfiguration Delay on SCell (Cell 3)

Parameter	Unit	Test		Test 1			Test 2	
		Configuration	T1	T2	Т3	T1	T2	T3
Channel number		Conf 1, 2, 3, 4,		3			3	
		5, 6, 7, 8, 9						
		Conf 1, 4, 7		N/A			N/A	
TDD configuration		Conf 2, 5, 8		TDDConf.1.	.1		TDDConf.1.1	
		Conf 3, 6, 9		TDDConf.2	.1		TDDConf.2.1	
		Conf 1, 4, 7		10: $N_{RB,c} = 5$	52		10: $N_{RB,c} = 52$	
BW <sub>channel</sub>	MHz	Conf 2, 5, 8	10: N <sub>RB,c</sub> = 52			10: N <sub>RB,c</sub> = 52		
	Conf 3, 6, 9 40: N <sub>RB,c</sub> = 106			06	40: N <sub>RB,c</sub> = 106			
		Conf 1, 4, 7	G- FR1- A3-3 in [13]	G-FR1- A3-3 in [13]	G-FR1- A3-3 in [13]	N/A	G-FR1- A3-3 in [13]	N/A
PUSCH parameters for NR UL carrier		Conf 2, 5, 8	G- FR1- A3-3 in [13]	G-FR1- A3-3 in [13]	G-FR1- A3-3 in [13]	N/A	G-FR1- A3-3 in [13]	N/A
		Conf 3, 6, 9	G- FR1- A3-7 in [13]	G-FR1- A3-7 in [13]	G-FR1- A3-7 in [13]	N/A	G-FR1- A3-7 in [13]	N/A

		Conf 1, 4, 7	Table	Table	Table			
			8.3.3.1	8.3.3.1.		NI/A	NI/A	NI/A
			.2-1 in	2-1 in	8.3.3.1.2	N/A	N/A	N/A
			[13]	[13]	-1 in [13]			
		Conf 2, 5, 8	Table	Table				
DU 0011		COIII 2, 5, 6			Table			
PUCCH parameters			8.3.3.1	8.3.3.1.	8.3.3.1.2	N/A	N/A	N/A
For NR UL carrier			.2-1 in	2-1 in	-1 in [13]			,, .
			[13]	[13]	-1 111[13]			
		Conf 3, 6, 9	Table	Table				
			8.3.3.1	8.3.3.1.	Table			
			.2-2 in	2-2 in	8.3.3.1.2	N/A	N/A	N/A
			[13]	[13]	-2 in [13]			
		0	[13]			0.504	0.504	O ED4
		Conf 1, 4, 7		G-FR1-		G-FR1-	G-FR1-	G-FR1-
			N/A	A3-3 in	N/A	A3-3 in	A3-3 in	A3-3 in
				[13]		[13]	[13]	[13]
PUSCH parameters		Conf 2, 5, 8		G-FR1-		G-FR1-	G-FR1-	G-FR1-
for supplementary		, , , ,	N/A	A3-3 in	N/A	A3-3 in	A3-3 in	A3-3 in
UL			14//	[13]	11//	[13]	[13]	[13]
l or		0						
		Conf 3, 6, 9		G-FR1-		G-FR1-	G-FR1-	G-FR1-
			N/A	A3-7 in	N/A	A3-7 in	A3-7 in	A3-7 in
	<u> </u>		<u> </u>	[13]		[13]	[13]	[13]
		Conf 1, 4, 7				Table	Table	Table
			N/A	N/A	N/A	8.3.3.1.2	8.3.3.1.2	8.3.3.1.2
			14// (	14// (	13// 3		-1 in [13]	-1 in [13]
		0 (0.5.0				-1 in [13]		-1111[13]
PUCCH parameters		Conf 2, 5, 8				Table	Table	Table
for supplementary			N/A	N/A	N/A	8.3.3.1.2	8.3.3.1.2	8.3.3.1.2
			19/7	19/7	IN/A		-1 in	
UL						-1 in [13]	[13]	-1 in [13]
		Conf 3, 6, 9				Table	Table	Table
		00111 0, 0, 0	N/A	N/A	N/A	8.3.3.1.2	8.3.3.1.2	8.3.3.1.2
			IN/A	IN/A	IN/A			
DD0011 (	ļ	0 (1 1 7		00 4 4 50		-2 in [13]	-2 in [13]	-2 in [13]
PDSCH reference		Conf 1, 4, 7		SR.1.1 FD			SR.1.1 FDD	
measurement		Conf 2, 5, 8		SR.1.1 TD	D		SR.1.1 TDD	
channel as defined		Conf 3, 6, 9		CD 0 4 TD	D			
in A.3.1.1				SR 2.1 TD	ט		SR 2.1 TDD	,
RMSI CORESET		Conf 1, 4, 7		CR.1.1 FD	D		CR.1.1 FDD	
reference		Conf 2, 5, 8		CR.1.1 TD			CR.1.1 TDD	
measurement				CIX. I. I I D	<i>D</i>	OR. I. I IBB		<u>'</u>
		Conf 3, 6, 9		00 0 4 70	_		00 0 4 TDD	
channel as defined				CR.2.1 TD	טי		CR.2.1 TDD	)
in A.3.1.2								
RMC CORESET		Conf 1, 4, 7	(	CCR.1.1 FI	DD		CR.1.1 FDI	)
reference		Conf 2, 5, 8		CCR.1.1 TI			CR.1.1 TDI	
measurement		Conf 3, 6, 9						
channel as defined		00111 3, 0, 3	,	CCR.2.1 TI	חר		CCR.2.1 TDI	<b>1</b>
			· '	JUN.2.1 11	טט	_	JUN.Z. I IDI	,
in A.3.1.3	<del>                                     </del>	0		05.4			00.4	
OCNG Pattern Note 1	ļ	Conf 1, 2, 3		OP.1			OP.1	
		Conf 1, 2, 4, 5,		SSB.1 FR	1		SSB.1 FR1	
SSB configuration		7,8		OOD.TTK	. 1		OOD. I I IXI	
_		Conf 3, 6, 9		SSB.2 FR	1		SSB.2 FR1	
		Conf 1, 2, 3, 4,						
SMTC configuration			SMTC.1			SMTC.1		
DL initial BWP	<b> </b>	5, 6, 7, 8, 9	<b> </b>					
		Conf 1, 2, 3, 4,	DLBWP.0.1			DLBWP.0.1		
configuration		5, 6, 7, 8, 9	525771.0.1					
DL dedicated BWP		Conf 1, 2, 3, 4,				DI DIA/D 4 4		
configuration		5, 6, 7, 8, 9		DLBWP.1.1			DLBWP.1.1	
UL dedicated BWP		Conf 1, 2, 3, 4,						
				ULBWP.1.	.1		ULBWP.1.1	
configuration		5, 6, 7, 8, 9						
EPRE ratio of PSS	dB	Conf 1, 2, 3, 4,		0			0	
to SSS	45	5, 6, 7, 8, 9		J			U	

	1	I				ı		
EPRE ratio of								
PBCH_DMRS to								
SSS								
EPRE ratio of PBCH								
to PBCH DMRS								
EPRE ratio of								
PDCCH DMRS to								
SSS								
EPRE ratio of								
PDCCH to								
PDCCH_DMRS								
EPRE ratio of								
PDSCH_DMRS to								
SSS								
EPRE ratio of								
PDSCH to								
PDSCH DMRS								
EPRE ratio of								
OCNG DMRS to								
SSS								
EPRE ratio of								
OCNG to OCNG								
DMRS								
	dBm /	Conf 1, 2, 3, 4,		-102			-102	
	15kHz	5, 6, 7, 8, 9		-102			-102	
$N_{oc}$ Note 2	ID /	Conf 1, 2, 4, 5,		400			400	
00	dBm/	7,8	-102 -102					
	SCS	Conf 3, 6, 9		-99		-99		
$\hat{\mathbf{r}} / \mathbf{N}$	dB	Conf 1, 2, 3, 4,	16	16	16	16	16	16
$\hat{E}_s/N_{oc}$	ub	5, 6, 7, 8, 9	10	10	10	10	10	10
Ĉ /L Note 3	in.	Conf 1, 2, 3, 4,	40	4.0	4.0	4.0	4.0	4.0
$\hat{E}_{ m s}/I_{ m ot}$ Note 3	dB	5, 6, 7, 8, 9	16	16	16	16	16	16
		Conf 1, 2, 4, 5,						
SS-RSRP Note 3	dBm/	7,8	-86	-86	-86	-86	-86	-86
00-10101	SCS	Conf 3, 6, 9	-83	-83	-83	-83	-83	-83
	dBm/	Conf 1, 2, 4, 5,	-00	-00	-00	-00	-00	-00
	9.36	7,8	-57.9	-57.9	-57.9	-57.9	-57.9	-57.9
		1,0	-51.8	-51.8	-51.8	-51.8	-57.8	-51.8
lo Note 3	MHz	0 (0 0 0						
	dBm/	Conf 3, 6, 9				<b>5</b>	<b>5</b> . 5	
	38.16		-51.8	-51.8	-51.8	-51.8	-51.8	-51.8
	MHz							
Propagation		Conf 1, 2, 3, 4,	AWGN		AWGN			
Condition		5, 6, 7, 8, 9	AVVGN				AWGIN	
Antenna		Conf 1, 2, 3, 4,		1 0	·		1 11 0	
configuration		5, 6, 7, 8, 9		1 x 2			1 x 2	
		· · · · · · · · · · · · · · · · · · ·						

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

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

NOTE 3:  $\hat{E}_s/I_{ot}$ , lo, and SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

### A.4.5.4.1.2 Test Requirements

In test 1 the UE shall be ready to start transmission on the supplementary uplink carrier on SCell within 20ms from the start of T2.

In test 1 the UE shall stop the transmission on the supplementary uplink carrier on SCell within 20ms from the start of T3.

In test 2 the UE shall be ready to start transmission on the NR uplink carrier on SCell within 20ms from the start of T2.

In test 2 the UE shall stop the transmission on the NR uplink carrier on SCell within 20ms from the start of T3.

All of the above test requirements shall be fulfilled in order for the observed UE UL carrier configuration delay and UE UL carrier release delay to be counted as correct. The rate of correct observed UE UL carrier configuration delay and UE UL carrier release delay during repeated tests shall be at least 90%.

### A.4.5.5 Beam Failure Detection and Link recovery procedures

# A.4.5.5.1 EN-DC Beam Failure Detection and Link Recovery Test for FR1 PSCell configured with SSB-based BFD and LR in non-DRX mode

### A.4.5.5.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set  $q_0$  configured for a serving PSCell and that the UE performs correct SSB-based link recovery based on beam candidate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.4.5.5.1.1-1, A.4.5.5.1.1-2, A.4.5.5.1.1-3 and A.4.5.5.1.1-4 below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.4.5.5.1.1-1 shows the variation of the downlink SNR of the PCell and the SNR of the SSB in set  $q_0$  in the active PSCell to emulate SSB based beam failure. Figure A.4.5.5.1.1-1 additionally shows the variation of the downlink SNR of the SSB in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [2] ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test 2.

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

Table A.4.5.5.1.1-1: Supported test configurations for FR1 PCell

Table A.4.5.5.1.1-2: General test parameters for FR1 PSCell for SSB-based beam failure detection and link recovery testing in non-DRX mode

Parameter	Unit	Value Test 1	Comment
Active E-UTRA PCell		Cell 1	
E-UTRA RF Channel Number		1	
Active PSCell		Cell 2	

RF Channel Number			2	
Duplex mode	Config 1, 4		FDD	
2 aprest 2 a	Config 2, 3, 5, 6	1	TDD	
BWchannel	Config 1, 4	MHz	10: NRB,c = 52	
	Config 2, 5		10: NRB,c = 52	
			·	
	Config 3, 6		40: NRB,c = 106	
DL initial BWP configuration	on Config 1, 2, 3, 4, 5, 6		DLBWP.0.1	
DL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.1.1	
UL initial BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.0.1	
UL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.1.1	
TDD Configuration	Config 1, 4		Not Applicable	
3	Config 2, 5		TDDConf.1.1	
	Config 3, 6	1	TDDConf.1.2	
CORESET Reference	Config 1, 4		CR. 1.1 FDD	
Channel	Config 2, 5	1	CR. 1.1 TDD	
	Config 3, 6	1	CR. 2.1 TDD	
SSB Configuration	Config 1, 4		SSB.3 FR1	
G	Config 2, 5	1	SSB.3 FR1	
	Config 3, 6	1	SSB.4 FR1	
SMTC Configuration	Config 1, 2, 4, 5		SMTC.1	
· ·	Config 3, 6	Ī	SMTC.1	
PDSCH/PDCCH subcarrie	er Config 1, 2, 4, 5		15 KHz	
spacing	Config 3, 6		30 KHz	
PRACH Configuration	Config 1, 2, 4, 5		Table A.3.8.2.4-1	
	Config 3, 6	=	Table A.3.8.2.4-1	
SSB Index assigned as BI	FD RS (a <sub>0</sub> )		0	
SSB Index assigned as CI			1	
OCNG parameters	22 . (91)		OP.1	
CP length			Normal	
Correlation Matrix and Ant	enna Configuration		2x2 Low	
	DCI format		1-0	
Beam failure detection	Number of Control OFDM symbols		2	
transmission parameters	Aggregation level	CCE	8	
	Ratio of	dB	0	
	hypothetical PDCCH RE energy to average CSI-RS RE energy	QD		
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0	
	DMRS precoder granularity		REG bundle size	
	REG bundle size		6	
DRX			OFF	

Gap pattern ID			gp0	
rlmInSyncOutOfSyncThreshold			absent	When the field is absent, the UE applies the value 0. (Table 8.1.1-1).
rsrp-ThresholdSSB		dBm	-98	Threshold used for Qout_LR_SSB
powerControlOffsetSS			db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMax(	Count		n1	see TS 38.321 [7], clause 5.17
beamFailureDetectionTime	er		pbfd4	see TS 38.321 [7], clause 5.17
CSI-RS configuration for CSI reporting	Config 1, 4		[CSI-RS.1.1 FDD]	
	Config 2, 5		[CSI-RS.1.1 TDD]	
	Config 3, 6		[CSI-RS.2.1 TDD]	
CSI-RS for tracking	Config 1, 4		[TRS.1.1 FDD]	
	Config 2, 5		[TRS.1.1 TDD]	
	Config 3, 6		[TRS.1.2 TDD]	
SSB Index assigned as RI	_M RS		0,1	
T310 timer		ms	1000	
N310			2	
T1		S	0.2	During this time the the UE shall be fully synchronized to cell 1
T2		s	0.37	
T3		s	0.24	
T4		s	0	_
T5		s	0.17	
D1		s	0.13	

Note 1: All configurations are assigned to the UE prior to the start of time period T1.

Note 2: UE-specific PDCCH is not transmitted after T1 starts.

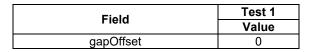
Note 3: E-UTRAN is in non-DRX mode under test.

Table A.4.5.5.1.1-3: Cell specific test parameters for FR1 PSCell for SSB-based beam failure detection and link recovery testing in non-DRX mode

Paramete	r	Unit	Test 1					
			T1	T2	Т3	T4	T5	
EPRE ratio of PDCCH DM	IRS to SSS	dB						
EPRE ratio of PDCCH to I	PDCCH DMRS	dB						
EPRE ratio of PBCH DMR	S to SSS	dB						
EPRE ratio of PBCH to PE	3CH DMRS	dB						
EPRE ratio of PSS to SSS	3	dB	0					
EPRE ratio of PDSCH DM	IRS to SSS	dB						
EPRE ratio of PDSCH to F	PDSCH DMRS	dB						
EPRE ratio of OCNG DMF	RS to SSS	dB						
EPRE ratio of OCNG to O	CNG DMRS	dB						
SNR_SSB of set q <sub>0</sub>	Config 1, 4		5	-3	-12	-12	-12	
	Config 2, 5	dB	5	-3	-12	-12	-12	
	Config 3, 6		5	-3	-12	-12	-12	
	Config 1, 4		-12	-12	5	5	5	
SNR_SSB of set q <sub>1</sub>	Config 2, 5	dB	-12	-12	5	5	5	
	Config 3, 6		-12	-12	5	5	5	

$N_{oc}$		Config 1, 4	dBm/15	-98			
<sup>1</sup> V oc		Config 2, 5	KHz	-98			
		Config 3, 6		-98			
Propagati	ion condition			TDL-C 300ns 100Hz			
Note 1:				in Cell 1 are fully allocated and a constant total			
				ed for all OFDM symbols.			
Note 2:				signed to the UE prior to the start of time period T1.			
Note 3:	NZP CSI-RS res	ource set configu	nfiguration for CSI reporting are assigned to the UE prior to the start				
	of time period T						
Note 4:			assigned to the UE prior to the start of time period T1.				
Note 5:	The timers and I	ayer 3 filtering rela	ated param	arameters are configured prior to the start of time period			
	T1.						
Note 6:				an the device under test as part of OCNG.			
Note 7:				ratio over the SSS REs.			
Note 8:				T5 is denoted as SNR1, SNR2 and SNR3			
	respectively in figure A.4.5.5.1.1-1.						
				E which supports 2RX on at least one band. For			
	•	vhich supports 4R	X on all ba	nds, the SNR during T3 is modified as specified in			
	clause [A.3.6].						

Table A.4.5.5.1.1-4: Measurement gap configuration for FR1 PSCell for SSB-based beam failure detection and link recovery testing in non-DRX mode



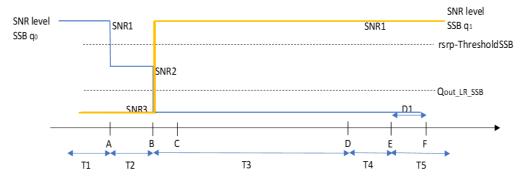


Figure A.4.5.5.1.1-1: SNR variation SSB for SSB-based beam failure detection and link recovery testing in non-DRX mode

## A.4.5.5.1.2 Test Requirements

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q<sub>1</sub>.

No later than time point F occurring no later than D1 = [120+10] ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit preamble on a beam associated with the candidate beam set  $q_1$  earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

# A.4.5.5.2 EN-DC Beam Failure Detection and Link Recovery Test for FR1 PSCell configured with SSB-based BFD and LR in DRX mode

#### A.4.5.5.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set  $q_0$  configured for a serving PSCell and that the UE performs correct SSB-based link recovery based on beam candidate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.4.5.5.2.1-1, A.4.5.5.2.1-2, A.4.5.5.2.1-3, A.4.5.5.2.1-4 and A.4.5.5.2.1-5 below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.4.5.5.2.1-1 shows the variation of the downlink SNR of the PCell and the SNR of the SSB in set  $q_0$  in the active PSCell to emulate SSB based beam failure. Figure A.4.5.5.2.1-1 additionally shows the variation of the downlink SNR of the SSB in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [2] ms. In the test, DRX configuration is enabled in PSCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

Table A.4.5.5.2.1-1: Supported test configurations for FR1 PCell

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

Table A.4.5.5.2.1-2: General test parameters for FR1 PCell for SSB-based beam failure detection and link recovery testing in DRX mode

Paramete	Parameter		Value	Comment
			Test 1	
Active E-UTRA PCell			Cell 1	
E-UTRA RF Channel Number	r		1	
Active PSCell			Cell 2	
RF Channel Number			2	
Duplex mode	Config 1, 4		FDD	
	Config 2, 3, 5, 6		TDD	
BWchannel	Config 1, 4	MHz	10: NRB,c = 52	
	Config 2, 5		10: NRB,c = 52	

	Config 3, 6		40: NRB,c = 106	
	_			
DL initial BWP configuration	n Config 1, 2, 3, 4, 5, 6		DLBWP.0.1	
DL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		DLBWP.1.1	
UL initial BWP configuration	n Config 1, 2, 3, 4, 5, 6		ULBWP.0.1	
UL dedicated BWP configuration	Config 1, 2, 3, 4, 5, 6		ULBWP.1.1	
TDD Configuration	Config 1, 4		Not Applicable	
_	Config 2, 5		TDDConf.1.1	
	Config 3, 6		TDDConf.1.2	
CORESET Reference	Config 1, 4		CR. 1.1 FDD	
Channel	Config 2, 5		CR. 1.1 TDD	
000 0 6 1	Config 3, 6		CR. 2.1 TDD	
SSB Configuration	Config 1, 4	-	SSB.3 FR1	
	Config 2, 5 Config 3, 6		SSB.3 FR1 SSB.4 FR1	
SMTC Configuration	Config 1, 2, 4, 5		SMTC.1	
Swite configuration	Config 3, 6	-	SMTC.1	
PDSCH/PDCCH subcarrie			15 KHz	
spacing	Config 3, 6		30 KHz	
	•		Table A.3.8.2.4-1	
PRACH Configuration	Config 1, 2, 4, 5			
	Config 3, 6		Table A.3.8.2.4-1	
SSB Index assigned as BF			0	
SSB Index assigned as CE	BD RS (q <sub>1</sub> )		1	
OCNG parameters			OP.1	
CP length			Normal	
Correlation Matrix and Ante			2x2 Low	
	DCI format		1-0	
Beam failure detection	Number of Control OFDM symbols		2	
transmission parameters	Aggregation level	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0	
	DMRS precoder granularity		REG bundle size	
	REG bundle size	1	6	
DRX			DRX.7	A.3.3.7
Gap pattern ID			N.A.	
rlmInSyncOutOfSyncThres	hold		absent	When the field is absent, the UE applies the value 0. (Table 8.1.1-1).
rsrp-ThresholdSSB		dBm	-98	Threshold used for Qout_LR_SSB

powerControlOffsetSS			db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMax(	Count		n1	see TS 38.321 [7], clause 5.17
beamFailureDetectionTim	er		pbfd4	see TS 38.321 [7], clause 5.17
CSI-RS configuration for CSI reporting	Config 1, 4		[CSI-RS.1.1 FDD]	
	Config 2, 5		[CSI-RS.1.1 TDD]	
	Config 3, 6		[CSI-RS.2.1 TDD]	
CSI-RS for tracking	Config 1, 4		[TRS.1.1 FDD]	
_	Config 2, 5		[TRS.1.1 TDD]	
	Config 3, 6		[TRS.1.2 TDD]	
SSB Index assigned as RI	LM RS		0,1	
T310 Timer		ms	1000	
N310			2	
T1		S	1	During this time the the UE shall be fully synchronized to cell 1
T2		S	5.17	
T3		S	3.24	
T4		S	0	
T5		S	1.97	
D1		S	1.93	

Note 1: All configurations are assigned to the UE prior to the start of time period T1.

Note 2: UE-specific PDCCH is not transmitted after T1 starts.

Note 3: E-UTRAN is in non-DRX mode under test.

Table A.4.5.5.2.1-3: Cell specific test parameters for FR1 PSCell for SSB-based beam failure detection and link recovery testing in DRX mode

Parame	eter	Unit	Test 1				
			T1	T2	Т3	T4	T5
EPRE ratio of PDCCH [	OMRS to SSS	dB					
EPRE ratio of PDCCH t	o PDCCH DMRS	dB					
EPRE ratio of PBCH DN	/IRS to SSS	dB					
EPRE ratio of PBCH to	PBCH DMRS	dB					
EPRE ratio of PSS to S	SS	dB			0		
EPRE ratio of PDSCH [	OMRS to SSS	dB					
EPRE ratio of PDSCH to	o PDSCH DMRS	dB					
EPRE ratio of OCNG D	MRS to SSS	dB					
EPRE ratio of OCNG to	OCNG DMRS	dB					
SNR_SSB of set q <sub>0</sub>	Config 1, 4		5	-3	-12	-12	-12
	Config 2, 5	dB	5	-3	-12	-12	-12
	Config 3, 6		5	-3	-12	-12	-12
	Config 1, 4		-12	-12	5	5	5
SNR_SSB of set q <sub>1</sub>	Config 2, 5	dB	-12	-12	5	5	5
	Config 3, 6		-12	-12	5	5	5
$N_{oc}$	Config 1, 4	dBm/15			-98		
1 voc	Config 2, 5	KHz			-98		
	Config 3, 6		·		-98		

Propagat	ion condition	TDL-C 300ns 100Hz			
Note 1:		ces in Cell 1 are fully allocated and a constant total			
	transmitted power spectral density is achie	eved for all OFDM symbols.			
Note 2:		assigned to the UE prior to the start of time period T1.			
Note 3:	NZP CSI-RS resource set configuration for	r CSI reporting are assigned to the UE prior to the start			
	of time period T1.				
Note 4:	Measurement gap configuration is assigned	ed to the UE prior to the start of time period T1.			
Note 5:	The timers and layer 3 filtering related par	ameters are configured prior to the start of time period			
	T1.				
Note 6:	The signal contains PDCCH for UEs other	than the device under test as part of OCNG.			
Note 7:	SNR levels correspond to the signal to noise ratio over the SSS REs.				
Note 8:	The SNR in time periods T1, T2, T3, T4 at	nd T5 is denoted as SNR1, SNR2 and SNR3			
	respectively in figure A.4.5.5.1.1-1.				
Note 9:	The SNR values are specified for testing a UE which supports 2RX on at least one band. For				
	testing of a UE which supports 4RX on all	bands, the SNR during T3 is modified as specified in			
	clause [A.3.6].	·			

#### Table A.4.5.5.2.1-4: Void

#### Table A.4.5.5.2.1-5: Void

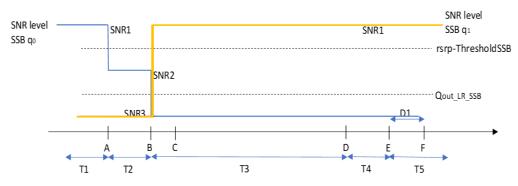


Figure A.4.5.5.2.1-1: SNR variation for SSB-based beam failure detection and link recovery testing in non-DRX mode

#### A.4.5.5.2.2 Test Requirements

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the shall detect beam failure and initiat link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q<sub>1</sub>.

No later than time point F occurring no later than D1 = [1920+10] ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit preamble on a beam associated with the candidate beam set  $q_1$  earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

# A.4.5.5.3 EN-DC Beam Failure Detection and Link Recovery Test for FR1 PSCell configured with CSI-RS-based BFD and LR in non-DRX mode

## A.4.5.5.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set  $q_0$  configured for a serving PSCell and that the UE performs correct CSI-RS-based link recovery based on beam candicate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR1 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.4.5.5.3.1-1, A.4.5.5.3.1-2, and A.4.5.5.3.1-3 below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.4.5.5.3.1-1 shows the variation of the downlink SNR of the PSCell and the SNR of the CSI-RS in set q<sub>0</sub> in the active PSCell to emulate CSI-RS based beam failure. Figure A.4.5.5.3.1-1 additionally shows the variation of the downlink SNR of the CSI-RS in set q<sub>1</sub> of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [2] ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements without gaps.

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

Table A.4.5.5.3.1-1: Supported test configurations for FR1 PSCell

Table A.4.5.5.3.1-2: General test parameters for FR1 PSCell for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode

Parame	Parameter		Value	Comment
			Test 1	
Active PCell			Cell 1	
RF Channel Number			1	
Duplex mode	Config 1, 4		FDD	
	Config 2, 3, 5,		TDD	
	6			
TDD Configuration	Config 1, 4		Not Applicable	
	Config 2, 5		TDDConf.1.1	
	Config 3, 6		TDDConf.1.2	
CORESET	Config 1, 4		CR.1.1 FDD	A.3.1.2
Reference Channel	Config 2, 5		CR.1.1 TDD	
	Config 3, 6		CR.2.1 TDD	
SSB Configuration	Config 1, 4		SSB.1 FR1	A.3.10
	Config 2, 5		SSB.1 FR1	
	Config 3, 6		SSB.2 FR1	
SMTC Configuration	Config 1, 2, 4,		SMTC.1	A.3.11
	5			
	Config 3, 6		SMTC.1	

PDSCH/PDCCH	Config 1, 2, 4,		15 KHz	
subcarrier spacing	5			
	Config 3, 6		30 KHz	
csi-RS-Index assigned detection RS in set q <sub>0</sub>	l as beam failure		0	
OCNG parameters			OP.1	A.3.2.1
CP length			Normal	
Correlation Matrix and Configuration	Antenna		2x2 Low	
Beam failure	DCI format		1-0	
detection	Number of		2	
transmission	Control OFDM			
parameters	symbols Aggregation	CCE	8	
	level	CCE	0	
	Ratio of	dB	0	
	hypothetical			
	PDCCH RE			
	energy to			
	average CSI- RS RE energy			
	Ratio of	dB	0	
	hypothetical	u u u	· ·	
	PDCCH DMRS			
	energy to			
	average CSI-			
	RS RE energy DMRS		REG bundle size	
	precoder		REG bullule size	
	granularity			
	REG bundle		6	
	size			
DRX			OFF	
Gap pattern ID csi-RS-Index assigned	l ac condidata		N.A. 1	
beam detection RS in			ı	
rlmInSyncOutOfSyncT			absent	When the field is
				absent, the UE
				applies the value 0.
TI 1 1000		ID	00	(Table 8.1.1-1).
rsrp-ThresholdSSB		dBm	-98	Threshold used for
powerControlOffsetSS	<u> </u>		db0	Q <sub>in_LR_SSB</sub> Used for deriving
powerodnastonosto			aso	rsrp-ThresholdCSI-
				RS
beamFailureInstanceN	/laxCount		n1	see TS 38.321 [7],
because B ( )	<b>T:</b>		L- C - L A	clause 5.17
beamFailureDetection	Timer		pbfd4	see TS 38.321 [7], clause 5.17
CSI-RS configuration	Config 1, 4		CSI-RS.1.2 FDD	A.3.14
for q <sub>0</sub> and q <sub>1</sub>	Config 2, 5		CSI-RS.1.2 TDD	
	Config 3, 6		CSI-RS.2.2 TDD	A 2 44
CSI-RS configuration	Config 1, 4		CSI-RS.1.1 FDD	A.3.14
for CSI reporting	Config 2, 5 Config 3, 6	-	CSI-RS.1.1 TDD CSI-RS.2.1 TDD	1
	Config 1, 4		TRS.1.1 FDD	
TRS configuration	Config 2, 5		TRS.1.1 TDD	
	Config 3, 6		TRS.1.2 TDD	
csi-RS-Index	Config 1, 4		CSI-RS.1.2 FDD	A.3.14
assigned as RLM RS	Config 2, 5	Ì	CSI-RS.1.2 TDD	

Config 3, 6		CSI-RS.2.2 TDD			
T310 Timer	ms	1000			
N310		2			
T1	s	1	During this time the the UE shall be fully synchronized to cell 1		
T2	S	0.18			
T3	S	0.14			
T4	s	0			
T5	s	0.08			
D1	S	0.04			
Note 1: UE-specific PDCCH is not transmitted after T1 starts.					

Table A.4.5.5.3.1-3: Cell specific test parameters for FR1 PSCell for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode

Parameter		Unit	Test 1				
			T1	T2	Т3	T4	T5
EPRE ratio of PDCCH DN	IRS to SSS	dB					
EPRE ratio of PDCCH to	PDCCH DMRS	dB					
EPRE ratio of PBCH DMF	RS to SSS	dB					
EPRE ratio of PBCH to PI	BCH DMRS	dB					
EPRE ratio of PSS to SSS	3	dB			0		
EPRE ratio of PDSCH DM	IRS to SSS	dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to O	CNG DMRS	dB					
SNR_CSI-RS of set q <sub>0</sub>	Config 1, 4		5	-3	-12	-12	-12
	Config 2, 5	dB	5	-3	-12	-12	-12
	Config 3, 6		5	-3	-12	-12	-12
	Config 1, 4		-12	-12	5	5	5
SNR_CSI-RS of set q <sub>1</sub>	Config 2, 5	dB	-12	-12	5	5	5
Config 3, 6			-12	-12	5	5	5
N <sub>oc</sub> Config 1, 4		dBm/15	-98				
Config 2, 5		KHz	-98				
Config 3, 6			-98				
Propagation condition				TDL-	-C 300ns 10	00Hz	

- Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
- Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
- Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
- Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
- Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.4.5.5.1.1-1.
- Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause [A.3.6].

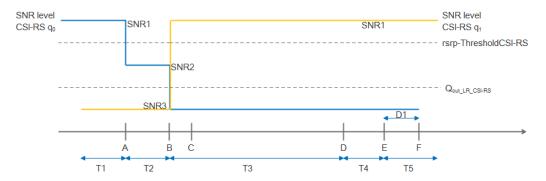


Figure A.4.5.5.3.1-1: SNR variation for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode

### A.4.5.5.3.2 Test Requirements

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the shall detect beam failure and initiat link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q<sub>1</sub>.

No later than time point F occurring no later than D1 = [30+10] ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit preamble on a beam associated with the candidate beam set  $q_1$  earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

# A.4.5.5.4 EN-DC Beam Failure Detection and Link Recovery Test for FR1 PSCell configured with CSI-RS-based BFD and LR in DRX mode

#### A.4.5.5.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set  $q_0$  configured for a serving PSCell and that the UE performs correct CSI-RS-based link recovery based on beam candicate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR1 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.4.5.5.4.1-1, A.4.5.5.4.1-2, A.4.5.5.4.1-3, and A.4.5.5.4.1-4 below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.4.5.5.4.1-1 shows the variation of the downlink SNR of the PSCell and the SNR of the CSI-RS in set  $q_0$  in the active PSCell to emulate CSI-RS based beam failure. Figure A.4.5.5.4.1-1 additionally shows the variation of the downlink SNR of the CSI-RS in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [2] ms. In the test, DRX configuration is enabled in PSCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

Table A.4.5.5.4.1-1: Supported test configurations for FR1 PSCell

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

Table A.4.5.5.4.1-2: General test parameters for FR1 PSCell for CSI-RS-based beam failure detection and link recovery testing in DRX mode

Paramete	r	Unit	Value	Comment
			Test 1	
Active PCell			Cell 1	
RF Channel Number			1	
Duplex mode	Config 1, 4		FDD	
	Config 2, 3, 5, 6		TDD	
TDD Configuration	Config 1, 4		Not Applicable	
	Config 2, 5		TDDConf.1.1	
	Config 3, 6		TDDConf.1.2	
CORESET Reference	Config 1, 4		CR.1.1 FDD	A.3.1.2
Channel	Config 2, 5		CR.1.1 TDD	
	Config 3, 6		CR.2.1 TDD	
SSB Configuration	Config 1, 4		SSB.1 FR1	A.3.10
	Config 2, 5		SSB.1 FR1	
	Config 3, 6		SSB.2 FR1	
SMTC Configuration	Config 1, 2, 4, 5		SMTC.1	A.3.11
	Config 3, 6		SMTC.1	
PDSCH/PDCCH	Config 1, 2, 4, 5		15 KHz	
subcarrier spacing	Config 3, 6		30 KHz	
csi-RS-Index assigned as to detection RS in set q <sub>0</sub>	eam failure		[0]	
OCNG parameters			OP.1	A.3.2.1
CP length			Normal	-
Correlation Matrix and Ante	enna Configuration		2x2 Low	
Beam failure detection	DCI format		1-0	
transmission parameters	Number of Control OFDM symbols		2	
	Aggregation level	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average CSI- RS RE energy	dB	0	

	Ratio of	dB	0	
	hypothetical			
	PDCCH DMRS			
	energy to			
	average CSI-			
	RS RE energy			
	DMRS precoder		REG bundle size	
	granularity			
	REG bundle		6	
	size			
DRX	0.20		DRX.7	A.3.3.7
Gap pattern ID			N.A.	7
csi-RS-Index assigned	as candidate heam		1	
detection RS in set q <sub>1</sub>	as candidate beam		'	
rlmInSyncOutOfSyncTh	prochold		absent	When the field is
	iresticia		absent	absent, the UE
				applies the value
TI 1 1100D		- 15	00	0. (Table 8.1.1-1).
rsrp-ThresholdSSB		dBm	-98	Threshold used for
0 1 10% 100				Qin_LR_SSB
powerControlOffsetSS			db0	Used for deriving
				rsrp-ThresholdCSI-
				RS
beamFailureInstanceMa	axCount		n1	see TS 38.321 [7],
				clause 5.17
beamFailureDetectionT	ïmer		pbfd4	see TS 38.321 [7],
			•	clause 5.17
CSI-RS configuration	Config 1, 4		CSI-RS.1.2 FDD	A.3.14
for q <sub>0</sub> and q <sub>1</sub>	Config 2, 5		CSI-RS.1.2 TDD	
1.	Config 3, 6		CSI-RS.2.2 TDD	
	Config 1, 4		CSI-RS.1.1 FDD	A.3.14
CSI-RS configuration	Config 2, 5		CSI-RS.1.1 TDD	7
for CSI reporting	Config 3, 6	1	CSI-RS.2.1 TDD	
	Config 1, 4		TRS.1.1 FDD	
TDC configuration			TRS.1.1 TDD	
TRS configuration	Config 2, 5			
	Config 3, 6		TRS.1.2 TDD	
csi-RS-Index	Config 1, 4		CSI-RS.1.2 FDD	
assigned as RLM RS	Config 2, 5		CSI-RS.1.2 TDD	A.3.14
	Config 3, 6		CSI-RS.2.2 TDD	
T310 Timer		ms	1000	
N310			2	
T1		S	1	During this time
				the the UE shall be
				fully synchronized
				to cell 1
T2	<del></del>	S	8.37	
T3		S	6.44	
T4		s	0	
T5		s	1.97	
D1		s	1.93	
	PDCCH is not transmitte			l
TAULE 1. UL-SPECIAL	DOOL IS NOT HAIRSTING	o allel	1 1 3tarts.	

Table A.4.5.5.4.1-3: Cell specific test parameters for FR1 PSCell for CSI-RS-based beam failure detection and link recovery testing in DRX mode

Parameter	Unit			Test 1		
		T1	T2	T3	T4	T5

EPRE ratio of PDCCH DN	dB						
EPRE ratio of PDCCH to	dB						
EPRE ratio of PBCH DMF	RS to SSS	dB					
EPRE ratio of PBCH to PI	BCH DMRS	dB					
EPRE ratio of PSS to SSS	3	dB			0		
EPRE ratio of PDSCH DM	IRS to SSS	dB					
EPRE ratio of PDSCH to I	PDSCH DMRS	dB					
EPRE ratio of OCNG DMI	RS to SSS	dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
SNR_CSI-RS of set q <sub>0</sub>	Config 1, 4		5	-3	-12	-12	-12
	Config 2, 5	dB	5	-3	-12	-12	-12
	Config 3, 6	7	5	-3	-12	-12	-12
	Config 1, 4		-12	-12	5	5	5
SNR_CSI-RS of set q <sub>1</sub>	Config 2, 5	dB	-12	-12	5	5	5
Config 3, 6			-12	-12	5	5	5
N <sub>oc</sub> Config 1, 4		dBm/15	-98				
Config 2, 5		KHz	-98				
		-98					
Propagation condition				TDL-	C 300ns 10	OHz ZHOC	
11 1 1 00110 1 111		. 6 . 4	e				

- Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
- Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
- Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
- Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
- Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.4.5.5.1.1-1.
- Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause [A.3.6].

Table A.4.5.5.4.1-4: Void

Table A.4.5.5.4.1-5: Void

Table A.4.5.5.4.1-6: Void

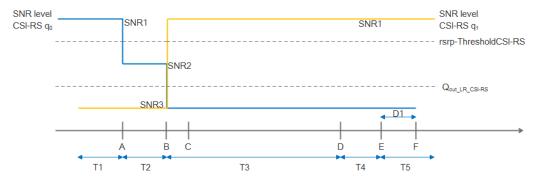


Figure A.4.5.5.4.1-1: SNR variation for CSI-RS-based beam failure detection and link recovery testing in DRX mode

## A.4.5.5.4.2 Test Requirements

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the shall detect beam failure and initiat link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q<sub>1</sub>.

No later than time point F occurring no later than D1 = [1920+10] ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit preamble on a beam associated with the candidate beam set  $q_1$  earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## A.4.5.6 Active BWP switch

#### A.4.5.6.1 DCI-based and Timer-based Active BWP Switch

## A.4.5.6.1.1 E-UTRAN – NR PSCell FR1 DL active BWP switch in non-DRX in synchronous EN-DC

## A.4.5.6.1.1.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement defined in TS38.133 clause 8.6, and interruption requirement for E-UTRA victim cell defined in TS36.133 clause 7.32.2.7. Supported test configurations are shown in Table A.4.5.6.1.1.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1), and one NR PSCell (Cell 2) as given in Table A.4.5.6.1.1.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of NR PSCell is specified in Table A.4.5.6.1.1.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

PDCCHs indicating new transmissions shall be sent continuously on PSCell (Cell 2) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 2 and the time duration of T2.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), and Cell 2 (PSCell) on radio channel 2 (PSCC).
- UE is configured with 2 different UE-specific downlink bandwidth parts for PSCell, BWP-1 and BWP-2, in Cell 2 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.
- UE is indicated in firstActiveDownlinkBWP-Id that the active DL BWP is BWP-1 in PSCell.
- UE is configured with a *bwp-InactivityTimer* timer value for PSCell.

All cells have constant signal levels throughout the test.

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

During T1,

Time period T1 starts when a DCI format 1\_1 command for PSCell DL BWP switch, sent from the test equipment to the UE, is received at the UE side in PSCell's slot # denoted i. The UE shall switch its bandwidth part from BWP-1 to BWP-2.

The UE shall be able to receive PDSCH at the beginning of the DL slot right after PSCell's DL slot  $(i+T_{BWPswitchDelay})$  as defined in clause 8.6 and starts to report valid ACK/NACK for the PSCell no later than at the beginning of the DL slot right after DL slot  $(i+T_{BWPswitchDelay}+kI)$ . The UE shall be continuously scheduled on PSCell's BWP-2 starting from the beginning of the DL slot right after DL slot  $(i+T_{BWPswitchDelay})$ .

The starting time of PCell(Cell 1) interruption due to BWP switch on PSCell shall occur within the BWP switch delay.

During T2, the test equipment won't transmit DCI format for PDSCH reception on PSCell(Cell 2).

## During T3,

The time period T3 starts from the slot #j, where j is the beginning slot of the DL subframe immediately after the *bwp-InactivityTimer* timer expires. The UE shall switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1.

The UE shall be able to receive PDSCH at the beginning of the DL slot right after PSCell's DL slot  $(j+T_{BWPswitchDelay})$  as defined in clause 8.6 and starts to report valid ACK/NACK for the PSCell at latest at the beginning of the DL slot right after DL slot  $(j+T_{BWPswitchDelay}+kI)$ . The UE shall be continuously scheduled on PSCell's BWP-1 starting from the beginning of the DL slot right after DL slot  $(j+T_{BWPswitchDelay})$ .

The starting time of PCell(Cell 1) interruption due to BWP switch of PSCell shall occur within the BWP switch delay.

The test equipment verifies the DL BWP switch time in PSCell by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK is received.

The test equipment verifies that potential interruption to E-UTRA PCell is carried out in the correct time span by monitoring ACK/NACK sent in PCell during BWP switch of PSCell, respectively.

Table A.4.5.6.1.1.1-1: DL BWP switch supported test configurations

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

Note 2: A UE which fulfils the requirements in test case A.4.5.6.1.2 can skip the test cases in A.4.5.6.1.1.

Table A.4.5.6.1.1.1-2: General test parameters for DL BWP switch in synchronous EN-DC

Parameter	Unit	Value	Comment
E-UTRA RF Channel		1	One E-UTRA radio channel is used for this
Number		-	test
NR RF Channel Number		2	One NR radio channel is used for this test
Active PCell		Cell 1	PCell on RF channel number 1.
Active PSCell		Cell 2	PSCell on RF channel number 2.
CP length		Normal	
DRX		OFF	For both PCell and PSCell
bwp-InactivityTimer	ms	[200]	
Cell-individual offset for cells	dB	0	Individual offset for cells on PCC.
on RF channel number 1	uБ	0	
Cell-individual offset for cells	dB	0	Individual offset for cells on PSCC.
on RF channel number 2	uБ	0	
Cell2 timing offset to cell1	μS	3	Synchronous EN-DC
T1	S	[0.2]	
T2	S	[0.2]	
T3	S	[0.2]	

Table A4.5.6.1.1.1-3: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC

Parameter		Unit	Cell 2
Frequency Range	Frequency Range		FR1
Duplex mode	Config 1,4		FDD
	Config 2,3,5,6		TDD
TDD configuration	Config 1,4		Not Applicable
	Config 2,5		TDDConf.1.1
	Config 3,6		TDDConf.1.2
BW <sub>channel</sub>	Config 1,4		10 MHz: N <sub>RB,c</sub> = 52
	Config 2,5		10 MHz: N <sub>RB,c</sub> = 52
	Config 3,6		40 MHz: N <sub>RB,c</sub> = 106
Active BWP ID	-		1, 2
Initial DL BWP	Config 1,4		
Configuration	Config 2,5		DLBWP.0.2 Note 4
	Config 3,6		
Active DL BWP-1	Config 1,4		
Configuration	Config 2,5		DLBWP.1.1 Note 4
	Config 3,6		
Active DL BWP-2	Config 1,4		
Configuration	Config 2,5		DLBWP.1.3 Note 4
	Config 3,6		
Initial UL BWP	Config 1,4		
Configuration	Config 2,5		ULBWP.0.2 Note 4
	Config 3,6		
Active UL BWP-1	Config 1,4		
Configuration	Config 2,5		ULBWP.1.1 Note 4
	Config 3,6		
Active UL BWP-2	Config 1,4		
Configuration	Config 2,5		ULBWP.1.3 Note 4
	Config 3,6		
PDSCH Reference	Config 1,4		SR.1.1 FDD
measurement channel	Config 2,5	1	SR.1.1 TDD
	Config 3,6	1	SR.2.1 TDD
	Config 1,4		CR.1.1 FDD

RMSI CO	RESET	Config 2,5		CR.1.1 TDD
parameter			1	CR.2.1 TDD
	CORESET	Config 1,4		CCR.1.1 FDD
parameter		Config 2,5	1	CCR.1.1 TDD
Parameter		Config 3,6	1	CCR.2.1 TDD
OCNG Pa	itterns	T Coming 5,6		OP.1
SSB Conf		Config 1,2,4,5		SSB.1 FR1
SSB Com	iguration	Config 3,6		SSB.2 FR1
SMTC Co	nfiguration	Cornig 5,0		SMTC.1
	n Matrix and A	ntonna		1x2 Low
Configura		Ileilia		TXZ LOW
TRS Conf		Config 1,4		TRS.1.1 FDD
110000111	iguration	Config 2,5		TRS.1.1 TDD
		Config 3,6		TRS.1.2 TDD
EPRE rati	o of PSS to SS		dB	0
	o of PBCH DM		4 45	ľ
	o of PBCH to F		1	
	o of PDCCH D		1	
		PDCCH DMRS	1	
	o of PDSCH D		1	
	o of PDSCH to		1	
		IRS to SSS(Note	1	
EPRE fau   1)		INO 10 000(NOIE		
	o of OCNG to	OCNIC DMPS	1	
(Note 1)	O OI OCING IO	OUMO DIMICO		
N <sub>oc</sub> Note 2		Config 1,2,4,5	dBm/SCS	[-104]
1400		Config 3,6	dBiii/000	[-101]
N <sub>oc</sub> Note 2		Corning 0,0	dBm/15kH	[-104]
Noc			Z Z	[-104]
SS-RSRP	Note 3	Config 1,2,4,5	dBm/SCS	[-87]
00110111		Config 3,6	42111/000	[-90]
Ê <sub>s</sub> /I <sub>ot</sub>		1 2011119 0,0	dB	[17]
Ês/Noc			dB	[17]
Io <sup>Note3</sup>			dBm/	[-59]
		Config 1,2,4,5	9.36MHz	[ [ ]
			dBm/	[-61.9]
		Config 3,6	38.16MHz	[]
Propagation	on Condition	1	333111112	AWGN
Note 1:				I .
total transmitted power spectral density is achieved for all OFDM symbols.				
Note 2: Interference from other cells and n				
assumed to be constant over subcarriers and time and shall be modelled a				
AWGN of appropriate power for Noc to be fulfilled.				
Note 3:				other parameters for
information purposes. They are not settable parameters themselves.				
Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is				
linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is				
		BWP.1.3 defined in		

## A.4.5.6.1.1.2 Test Requirements

During T1, the UE shall start to send the ACK for PSCell in the DL slot right after DL slot  $(i+T_{BWPswitchDelay}+k1)$ .

During T3, the UE shall start to send the ACK for PSCell in the DL slot right after DL slot  $(j+T_{BWPswitchDelay}+k1)$ .

Where, kI is the timing between DL data receiving and acknowledgement as specified in [7].

Depending on UE capability *bwp-SwitchingDelay* [2], UE shall finish BWP switch within the time duration  $T_{BWPswitchDelay}$  defined in Table 8.6.2-1.

All of the above test requirements shall be fulfilled in order for the observed PSCell active BWP switch delay to be counted as correct.

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

During T1, the start time of PCell interruption during PSCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start time of PCell interruption of during PSCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of PCell shall not be longer than the interruption duration specified for active BWP switch in TS36.133 Clause 7.32.2.7.

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch interruption to be counted as correct.

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

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK in the DL slot right after DL slot  $(i+T_{BWPswitchDelay}+kI)$ ,  $(j+T_{BWPswitchDelay}+kI)$ , then the UE shall use the next available uplink resource for reporting the corresponding ACK.

## A.4.5.6.1.2 E-UTRAN – NR PSCell FR1 DL active BWP switch with FR1 SCell in non-DRX in synchronous EN-DC

#### A.4.5.6.1.2.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement defined in clause 8.6, and interruption requirements for NR victim cell defined in clause 8.2.1.2.7 and interruption requirement for E-UTRA victim cell defined in clause 7.32.2.7 of TS 36.133 [15]. Supported test configurations are shown in Table A.4.5.6.1.2.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1), one NR PSCell (Cell 2) and one NR SCell (Cell 3) as given in Table A.4.5.6.1.2.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of NR PSCell and SCell are specified in Table A.4.5.6.1.2.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) and SCell (Cell 3) to ensure that the UE will have ACK/NACK sending.

PDCCHs indicating new transmissions shall be sent continuously on PSCell (Cell 2) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 2 and the time duration of T2.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), Cell 2 (PSCell) on radio channel 2 (PSCC) and Cell 3 (SCell) on radio channel 3 (SCC).
- UE is configured with 2 different UE-specific downlink bandwidth parts for PSCell, BWP-1 and BWP-2, in Cell 2 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.
- UE is configured with 1 UE-specific downlink bandwidth parts the same as initial BWP for SCell, BWP-0 in Cell 3 before starting the test.
- UE is indicated in firstActiveDownlinkBWP-Id that the active DL BWP is BWP-1 in PSCell.
- UE is indicated in firstActiveDownlinkBWP-Id that the active DL BWP is BWP-0 in SCell.

- UE is configured with a *bwp-InactivityTimer* timer value for PSCell.

All cells have constant signal levels throughout the test.

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

#### During T1,

Time period T1 starts when a DCI format 1\_1 command for PSCell DL BWP switch, sent from the test equipment to the UE, is received at the UE side in PSCell's slot # denoted i. The UE shall switch its bandwidth part from BWP-1 to BWP-2.

The UE shall be able to receive PDSCH at the beginning of the DL slot right after PSCell's DL slot  $(i+T_{BWPswitchDelay})$  as defined in clause 8.6 and starts to report valid ACK/NACK for the PSCell no later than at the beginning of the DL slot right after slot  $(i+T_{BWPswitchDelay}+kI)$ . The UE shall be continuously scheduled on PSCell's BWP-2 starting from the beginning of the DL slot right after slot  $(i+T_{BWPswitchDelay})$ .

PCell(Cell 1) interruption due to BWP switch on PSCell shall occur within the BWP switch delay.

SCell(Cell 3) interruption due to BWP switch on PSCell shall occur within the BWP switch delay.

During T2, the test equipment won't transmit DCI format for PDSCH reception on PSCell(Cell 2).

## During T3,

The time period T3 starts from the slot #j, where j is the beginning slot of the DL subframe immediately after the slot wherein *bwp-InactivityTimer* timer expires. The UE shall switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1.

The UE shall be able to receive PDSCH at the beginning of the DL slot right after PSCell's DL slot  $(j+T_{BWPswitchDelay})$  as defined in clause 8.6 and starts to report valid ACK/NACK for the PSCell at latest at the beginning of the DL slot right after slot  $(j+T_{BWPswitchDelay}+k1)$ . The UE shall be continuously scheduled on PSCell's BWP-1 starting from the beginning of the DL slot right after slot  $(j+T_{BWPswitchDelay})$ .

PCell(Cell 1) interruption due to BWP switch of PSCell shall occur within the BWP switch delay.

SCell(Cell 3) interruption due to BWP switch of PSCell shall occur within the BWP switch delay.

The test equipment verifies the DL BWP switch time in PSCell by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK is received.

The test equipment verifies that potential interruption to E-UTRA PCell and NR SCell is carried out in the correct time span by monitoring ACK/NACK sent in PCell and SCell during BWP switch of PSCell, respectively.

Table A.4.5.6.1.2.1-1: DL BWP switch supported test configurations

	Config	Description
1		LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2		LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3		LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
4		LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
5		LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6		LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note 1:	The UE is only re	equired to be tested in one of the supported test configurations
Note 2:	A UE which fulfil	s the requirements in test case A.4.5.6.1.2 can skip the test cases in A.4.5.6.1.1.
Note 3:	NR configuration	n is the same for PSCell and SCells.

Table A.4.5.6.1.2.1-2: General test parameters for DL BWP switch in synchronous EN-DC

Parameter	Unit	Value	Comment
E-UTRA RF Channel		1	One E-UTRA radio channel is used for this
Number		-	test
NR RF Channel Number		2, 3	Two NR radio channel is used for this test
Active PCell		Cell 1	PCell on RF channel number 1.
Active PSCell		Cell 2	PSCell on RF channel number 2.
Active SCell		Cell 3	SCell on RF channel number 3.
CP length		Normal	
DRX		OFF	
bwp-InactivityTimer	ms	[200]	
Cell-individual offset for cells	dB	0	Individual offset for cells on PCC.
on RF channel number 1	uБ	0	
Cell-individual offset for cells	dB	0	Individual offset for cells on PSCC.
on RF channel number 2	uБ	O	
Cell-individual offset for cells	dB	0	Individual offset for cells on SCC.
on RF channel number 3	uБ	O	
Cell2 timing offset to cell1	μS	3	Synchronous EN-DC
Cell3 timing offset to cell2	μS	3	Synchronous cells
T1	S	[0.2]	
T2	S	[0.2]	
T3	S	[0.2]	

Table A.4.5.6.1.2.1-3: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC

Parameter		Unit	Cell 2	Cell 3	
Frequency Range			FF	R1	
Duplex mode	Config 1,4		FDD		
	Config 2,3,5,6		TDD		
TDD configuration	Config 1,4		Not App	olicable	
	Config 2,5		TDDC	onf.1.1	
	Config 3,6		TDDC	onf.1.2	
BWchannel	Config 1,4		10 MHz: I	N <sub>RB,c</sub> = 52	
	Config 2,5		10 MHz: I	N <sub>RB,c</sub> = 52	
	Config 3,6		40 MHz: N	I <sub>RB,c</sub> = 106	
Active BWP ID	-		1, 2	0	
Initial BWP	Config 1,4		DLBWP.0.2	DLBWP.0.2	
Configuration	Config 2,5				
	Config 3,6				
Active BWP-0	Config 1,4		NA	DLBWP.0.2	
Configuration	Config 2,5				
	Config 3,6				
Active BWP-1	Config 1,4		DLBWP.1.3	NA	
Configuration	Config 2,5				
	Config 3,6				
Active BWP-2	Config 1,4		DLBWP.1.1	NA	
Configuration	Config 2,5				
	Config 3,6				
PDSCH Reference	Config 1,4		SR.1.1 FDD		
measurement channel	Config 2,5		SR.1.1 TDD		
	Config 3,6		SR2.1 TDD		
RMSI CORESET	Config 1,4		CR.1.1 FDD		
parameters	Config 2,5		CR.1.1 TDD		
	Config 3,6		CR2.1	TDD	

Dedicated CORESET	Dedicated CORESET Config 1,4		CCR.1	I.1 FDD	
parameters	Config 2,5		CCR.1	I.1 TDD	
Config 3,6			CCR.2.1 TDD		
OCNG Patterns			OP.1		
SSB Configuration	Config 1,2,4,5		SSB.	1 FR1	
-	Config 3,6		SSB.	2 FR1	
SMTC Configuration	· · · ·		SM	TC.1	
TRS Configuration	Config 1,4		TRS.1	.1 FDD	
	Config 2,5		TRS.1	.1 TDD	
	Config 3,6		TRS.1	.2 TDD	
Antenna Configuration			1	x2	
Propagation Condition			AV	VGN	
EPRE ratio of PSS to SS	SS	dB	0	0	
EPRE ratio of PBCH DM	IRS to SSS				
EPRE ratio of PBCH to I	PBCH DMRS				
EPRE ratio of PDCCH D	MRS to SSS				
EPRE ratio of PDCCH to	PDCCH DMRS				
EPRE ratio of PDSCH D	MRS to SSS				
EPRE ratio of PDSCH to	PDSCH				
EPRE ratio of OCNG DN	/IRS to SSS Note 1				
EPRE ratio of OCNG to	OCNG DMRS Note 1				
N <sub>oc</sub> Note 2		dBm/15 kHz	[-104]	[-104]	
SS-RSRP Note 3		dBm/15 kHz	[-87]	[-87]	
Ê <sub>s</sub> /I <sub>ot</sub>		dB	17	17	
Ês/Noc		dB	17	17	
Io <sup>Note3</sup>	Config 1,2,4,5	dBm/	[-59]	[-59]	
	Corning 1,2,4,5	9.36MHz		<u> </u>	
Config 3,6		dBm/	[-61.9]	[-61.9]	
		38.16MHz			
spectral dens	ity is achieved for all	OFDM symbols.	located and a constant to	otal transmitted power	

- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N₀c to be fulfilled.
- Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3].

#### A.4.5.6.1.2.2 Test Requirements

During T1, the UE shall start to send the ACK for PSCell in the DL slot right after slot  $(i+T_{BWPswitchDelay}+kI)$ .

During T3, the UE shall start to send the ACK for PSCell in the DL slot right after slot  $(j+T_{BWPswitchDelay}+k11)$ .

All of the above test requirements shall be fulfilled in order for the observed PSCell active BWP switch delay to be counted as correct.

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

During T1, the start of the interruption of PCell during PSCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start of the interruption of PCell during PSCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of PCell shall not be longer than the interruption duration specified for active BWP switch in clause 7.32.2.7 of TS 36.133 [15].

During T1, the start of the interruption of SCell during PSCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start of the interruption of SCell during PSCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of SCell shall not be longer than the interruption duration specified for active BWP switch in clause 8.6.2.

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch interruption to be counted as correct.

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

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK in the DL slot right after slot  $(i+T_{BWPswitchDelay}+kI)$ ,  $(j+T_{BWPswitchDelay}+kI)$ , then the UE shall use the next available uplink resource for reporting the corresponding ACK.

Editor's note: FFS value of k1 for type 1 and type 2 UE.

#### A.4.5.6.2 RRC-based Active BWP Switch

A.4.5.6.2.1 E-UTRAN – NR PSCell FR1 DL active BWP switch in non-DRX in synchronous EN-DC

#### A.4.5.6.2.1.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement for RRC-based BWP switch defined in clause 8.6.3. Supported test configurations are shown in Table A.4.5.6.2.1.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1) and one NR PSCell (Cell 2) as given in Table A.4.5.6.2.1.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of NR PSCell are specified in Table A.4.5.6.2.1.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC) and to Cell 2 (PSCell) on radio channel 2 (PSCC).
- UE has bandwidth part BWP-1 in its RRC-configuration for Cell 1 (PSCell).
- UE is indicated in firstActiveDownlinkBWP-Id that the active DL BWP is BWP-1 in PSCell.

All cells have constant signal levels throughout the test.

The test consists of 1 time period, with duration of T1.

During T1,

Time period T1 starts when a *RRCReconfiguration* with updated bandwidth part configuration, sent from the test equipment to the UE, is completely received at the UE side in PSCell's slot # denoted i. The UE shall reconfigure its bandwidth part with the updated bandwidth part configuration.

The UE shall be able to receive PDSCH at the beginning of the DL slot right after PSCell's DL slot  $(i+T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC})$  as defined in clause 8.6.3 and be ready for the reception of uplink grant for the PSCell no later than at the beginning of the DL slot right after slot  $(i+T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC})$ . The UE shall be continuously scheduled on PSCell's BWP-1 starting from the beginning of the DL slot right after slot  $(i+T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC})$ .

 $T_{RRCprocessingDelay}$  and  $T_{BWPswitchDelayRRC}$  are defined in clause 8.6.3.

The test equipment verifies the DL BWP switch time in PSCell by counting the time from the time when the RRC Reconfiguration message including updated BWP configuration is sent till the time when RRC Reconfiguration Complete message is received.

Table A.4.5.6.2.1.1-1: DL BWP switch supported test configurations

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

Table A.4.5.6.2.1.1-2: General test parameters for DL BWP switch in synchronous EN-DC

Parameter	Unit	Value	Comment
E-UTRA RF Channel		1	One E-UTRA radio channel is used for this
Number		'	test
NR RF Channel Number		2	One NR radio channel is used for this test
Active PCell		Cell 1	PCell on RF channel number 1.
Active PSCell		Cell 2	PSCell on RF channel number 2.
CP length		Normal	
DRX		OFF	
Cell-individual offset for cells	dB	0	Individual offset for cells on PCC.
on RF channel number 1	u D	0	
Cell-individual offset for cells	dB	0	Individual offset for cells on PSCC.
on RF channel number 2	uБ	U	
Cell2 timing offset to cell1	μS	3	Synchronous EN-DC
T1	S	[0.2]	

Table A.4.5.6.2.1.1-3: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC

Parame	ter	Unit	Cell 2
Frequency Range		0.1110	FR1
Duplex mode	Config 1,4		FDD
	Config 2,3,5,6	1	TDD
TDD configuration	Config 1,4		Not Applicable
3	Config 2,5	1	TDDConf.1.1
	Config 3,6	1	TDDConf.1.2
BW <sub>channel</sub>	Config 1,4		10 MHz: N <sub>RB,c</sub> = 52
	Config 2,5	1	10 MHz: N <sub>RB,c</sub> = 52
	Config 3,6	1	40 MHz: N <sub>RB,c</sub> = 106
Active DL BWP ID			1
Initial DL BWP	Config 1,4		DLBWP.0.2
Configuration	Config 2,5		
	Config 3,6		
Initial UL BWP	Config 1,4		ULBWP.0.2
Configuration	Config 2,5		
-	Config 3,6		
Initial Active DL	Config 1,4		DLBWP.1.3
Condition BWP-1	Config 2,5		
Configurat	Config 3,6		
Active UL	Config 1,4		ULBWP.1.3
BWP-1	Config 2,5	-	OLDWI 11.0
Configurat		1	
ion	Config 3,6		
Final Active DL	Config 1,4		DLBWP.1.1
Condition BWP-1	Config 2,5	-	
Configurat ion	Config 3,6		
Active UL	Config 1,4		ULBWP.1.1
BWP-1	Config 2,5		
Configurat ion	Config 3,6		
Initial UL BWP	Config 1,4		ULBWP.0.2
Configuration	Config 2,5		
	Config 3,6	1	
Active UL BWP-1	Config 1,4		ULBWP.1.3
Configuration	Config 2,5		
	Config 3,6		
Active UL BWP-2	Config 1,4		ULBWP.1.1
Configuration	Config 2,5		
	Config 3,6		
PDSCH Reference	Config 1,4	]	SR.1.1 FDD
measurement channel	Config 2,5	] [	SR.1.1 TDD
	Config 3,6		SR2.1 TDD
RMSI CORESET	Config 1,4	]	CR.1.1 FDD
parameters	Config 2,5	] [	CR.1.1 TDD
	Config 3,6		CR2.1 TDD
Dedicated CORESET	Config 1,4	<u> </u>	CCR.1.1 FDD
parameters	Config 2,5	<u> </u>	CCR.1.1 TDD
00110 P. #	Config 3,6		CCR.2.1 TDD
OCNG Patterns			OP.1
SSB Configuration	Config 1,2,4,5		SSB.1 FR1
01470.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.	Config 3,6		SSB.2 FR1
SMTC Configuration			SMTC.1
TRS Configuration	Config 1,4		TRS.1.1 FDD
	Config 2,5		TRS.1.1 TDD
	Config 3,6		TRS.1.2 TDD
Antenna Configuration			1x2

Propagat	ion Condition			AWGN	
	o of PSS to SSS		dB	0	
EPRE ratio	o of PBCH DMRS	to SSS			
	o of PBCH to PBC				
	o of PDCCH DMR				
	o of PDCCH to PD				
	o of PDSCH DMR				
	o of PDSCH to PD				
	o of OCNG DMRS	. ,	-		
	o of OCNG to OCI	NG DMRS (Note 1)	ID /45	F 40 41	
Noc <sup>Note 2</sup>			dBm/15	[-104]	
	- N-4- 0		kHz		
SS-RSRF	O Note 3		dBm/15	[-87]	
			kHz		
Ês/Iot			dB	17	
Ês/Noc			dB	17	
Io <sup>Note3</sup>		Config 1,2,4,5	dBm/ 9.36MHz	[-59]	
		Config 3,6	dBm/ 38.16MHz	[-61.9]	
Note 1:				y allocated and a constant red for all OFDM symbols.	
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{\text{oc}}$ to be fulfilled.					
Note 3:		other parameters for meters themselves.			
Note 4:	is linked with U	pectrum, a DL BWF JLBWP.0.2; DLBWF linked with ULBWP	P.1.1 is linked v		

## A.4.5.6.2.1.2 Test Requirements

During T1, the UE shall be ready for the reception of uplink grant for PSCell in the beginning of the DL slot right after slot ( $i + T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}$ ).

All of the above test requirements shall be fulfilled in order for the observed PSCell active BWP switch delay to be counted as correct.

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

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

## A.4.5.7 PSCell addition and release delay

## A.4.5.7.1 Addition and Release Delay of known NR PSCell

## A.4.5.7.1.1 Test purpose and environment

The purpose of this test is to verify that the NR PSCell addition and release delays under EN-DC are within the requirements stated in clause 7.31.2 [15] for the case when the PSCell is known by the UE at the time of addition.

Supported test configurations are shown in A.4.5.7.1.1-1. The test parameters for the E-UTRA cell are given in Table A.3.7.2.1-1. The E-UTRA cell once set up is not changed across time.

The test parameters for NR cell are given in Tables A.4.5.7.1.1-2 and cell-specific parameters in A.4.5.7.1.1-3 below. The test consists of five successive time periods with duration of T1, T2, T3, T4 and T5 respectively. There

are two carriers each with one cell. Before the test starts the UE is connected to Cell 1 (E-UTRA PCell) on radio channel 1 (PCC) but is not aware of Cell 2 (NR PSCell) on radio channel 2. The UE is only monitoring the PCC. During T1 only Cell1 is known to the UE.

Before the start of T2, the UE in the measurement control information that event-triggered reporting with Event A4 is configured for neighbour cell (Cell2). Before the start of T2 the UE is configured with the measurement gaps (gap pattern Id # 0). The Cell2 becomes known to the UE during T2. Therefore, during T2 the UE shall report Event A4. After receiving the Event A4, the test system shall send a RRC message to the UE to release the measurement gaps.

The test system shall send a RRC message to the UE to add PSCell (Cell 2) on radio channel 2. The RRC message (to add PSCell) also includes a request for the UE to start periodic CSI reporting for the PSCell after the PSCell has been successfully added. The RRC message to add PSCell shall be sent to the UE during period T2, after the measurement gaps are released by the test system. The point in time at which the RRC message to add PSCell (Cell2) is received at the UE antenna connector defines the start of period T3.

The test system shall observe the periodic reporting of CSI for PSCell during T4. The point in time at which the UE has sent PRACH to the PSCell (Cell 2) defines the start of period T4.

The test system shall send a RRC message to the UE to release PSCell (Cell 2) on radio channel 2. The RRC message to release PSCell (Cell2) shall be sent to the UE during period T4, after the UE has sent at least one CQI report with non-zero CQI index for PSCell (Cell 2). The point in time at which the RRC message to release PSCell (Cell2) is received at the UE antenna connector defines the start of period T5.

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

Table A.4.5.7.1.1-1: Supported test configurations for FR1 PSCell

Table A.4.5.7.1.1-2: General Test Parameters for PSCell Addition and Release

Parameter		Unit	Value	Comment
RF Channel	Number		1, 2	Two radio channels are used for this test. One for E-UTRA cell and second for NR Cell
Initial	Active PCell		Cell1	PCell on RF channel number 1.
Condition	Neighbour cell		Cell2	Neighbour cell on RF channel number 2.
Final	Active PCell		Cell1	PCell on RF channel number 1.
Condition	Neighbour Cell		Cell2	PSCell released on RF channel number 2.
B1	Hysteresis	dB	0	Hysteresis for evaluation of event B1.
	Threshold RSRP	dBm	-93	Actual RSRP threshold for event B1. Needs to take absolute accuracy tolerance in clause 9.1.11.1 into account plus margin.
	Time to Trigger	S	0	

DRX		OFF	Continuous monitoring of primary cell
Measurement gap pattern Id		0	Gaps are configured before T2 and released
			before T3.
PRACH configuration on cell2		FR1 PRACH	Captured in A.3.8.2.1
		configuration	
		2	
CQI/PMI periodicity and offset configuration index on cell2		[2ms]	CQI reporting for PSCell every uplink subframe
Cell-individual offset for cells on RF channel number 1	dB	0	Individual offset for cells on primary component carrier.
Cell-individual offset for cells on RF channel number 2	dB	0	Individual offset for cells on carrier frequency of cell2.
T1	s	1	During this time the PCell shall be known and cell2 shall be unknown.
T2	s	1	During this time the UE shall identify neighbour cell (cell2) and report event B1.
T3	S	0.5	During this time the UE adds the PSCell.
T4	s	0.5	During this time the UE sends CSI reports for PSCell.
T5	S	0.5	During this time the UE releases the PSCell.

Table A.4.5.7.1.1-3: Cell Specific Parameters for PSCell Addition and Release

Parameter	Unit	Config	Test				
Parameter	Offic	Coming	T1	T2	T3	T4	T5
E-UTRA RF Channel Number		1,2,3,4,5,6	1				
NR RF Channel Number		1,2,3,4,5,6			2		
TDD		1,4		No	ot Applical	ole	
configuration		2,5		Т	DDConf.1	.1	
_		3,6		T	DDConf.1	.2	
		1,4		10	): N <sub>RB,c</sub> = :	52	
BW <sub>channel</sub>	MHz	2,5		10	$N_{RB,c} = $	52	
		3,6		40	: N <sub>RB,c</sub> = 1	06	
Initial BWP		1,2,3			DLBWP.0.		
Configuration		1,2,0			JLBWP.0.		
Dedicated BWP		1,2,3	DLBWP.1.1				
Configuration					JLBWP.1.		
PDSCH Reference		1,4			R.1.1 FD		
measurement		2,5		S	R.1.1 TD	D	
channel		3,6	SR.2.1 TDD				
RMSI CORESET		1,4	CR.1.1 FDD				
Reference		2,5	CR.1.1 TDD			D	
Channel		3,6		(	R.2.1 TD	D	
Dedicated		1,4		С	CR.1.1 FE	)D	
CORESET		2,5		С	CR.1.1 TE	)D	
Reference Channel		3,6	CCR.2.1 TDD				
OCNG Patterns		1,2,3,4,5,6	OP.1				
SSB		1,2,4,5	SSB.1 FR1				
configuration		3,6		(	SSB.2 FR	1	
		1,2,4,5	SMTC.1				

SMTC		3,6		SMTC.1
configuration		·		
TRS		1,4		TRS.1.1 FDD
Configuration		2,5		TRS.1.1 TDD
EPRE ratio of		3,6		TRS.1.2 TDD
PSS to SSS				
EPRE ratio of				
PBCH DMRS to				
SSS				
EPRE ratio of				
PBCH to PBCH				
DMRS EPRE ratio of				
PDCCH DMRS				
to SSS				
EPRE ratio of				
PDCCH to	dB	1,2,3,4,5,6		0
PDCCH DMRS		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		· ·
EPRE ratio of PDSCH DMRS				
to SSS				
EPRE ratio of				
PDSCH to				
PDSCH				
EPRE ratio of				
OCNG DMRS to SSS(Note 1)				
EPRE ratio of				
OCNG to OCNG				
DMRS (Note 1)				
$N_{oc}$ Note2	dBm/15 kHz	1,2,3,4,5,6	N/A	-85
$N_{oc}$ Note2	dBm/SCS	1,2,4,5	N/A	-85
1 voc	ubili/3C3	3,6	N/A	-82
$\hat{E}_{s}/I_{ot}$		1,2,3,4,5,6	-infinity	0
$\hat{E}_s/N_{oc}$		1,2,3,4,5,6	-infinity	0
SS-RSRP <sup>Note3</sup>	dBm/SCS	1,2,4,5	-infinity	-85
		3,6	-infinity	-82
Io <sup>Note3</sup>	dBm/9.36MHz	1,2,4,5	N/A	-57
_	dBm/38.1MHz	3,6	N/A	-51
Propagation		1,2,3,4,5,6		AWGN
condition				

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

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

Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

## A.4.5.7.1.2 Test Requirements

The UE shall transmit the PRACH to PSCell at latest 82 ms<sup>Note1</sup> into T3.

The UE shall send at least one CSI report for PSCell with non-zero CQI index during T4.

The UE shall periodically send CSI reports for PSCell after the UE has sent first CQI report with non-zero CQI index during T4

The UE shall stop sending CSI reports for PSCell in at latest [20]ms into T5.

All the above test requirements shall be fulfilled in order for the observed PSCell addition delay and PSCell release delay to be counted as correct. The rate of correct observed PSCell addition delay and PSCell release delay during repeated tests shall be at least 90%.

Note1: The PSCell addition delay can be expressed as follows as specified in clause 7.31.2 [15]:

$$T_{config~PSCell} = T_{RRC~delay} + T_{processing} + T_{search} + T_{\Delta} + T_{PSCell~DU} + 2msWhere:$$

 $T_{RRC\ delay} = 20 ms$ 

 $T_{\text{processing}} = 20 \text{ms}$ 

 $T_{search} \quad = 0$ 

 $T_{\Delta} = 20 \text{ms}$ 

 $T_{PSCell\ DU} = 1*10+10 = 20ms$ 

## A.4.6 Measurement procedure

## A.4.6.1 Intra-frequency Measurements

## A.4.6.1.1 EN-DC event triggered reporting tests without gap under non-DRX

#### A.4.6.1.1.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2.

#### A.4.6.1.1.2 Test parameters

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell. The test parameters for PSCell are given in Table A.4.6.1.1.2-1, A.4.6.1.1.2-2, A.4.6.1.1.2-3 below and the test parameters and applicability for the E-UTRAN cell are defined in A.3.7.2. In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

Table A.4.6.1.1.2-1: Supported test configurations

Con	figuration	Description				
1		15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode				
2		15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode				
3		30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode				
Note:	Note: The UE is only required to be tested in one of the supported test configurations.					

Table A.4.6.1.1.2-2: General test parameters for EN-DC intra-frequency event triggered reporting without gap for PSCell in FR1

Parameter	Unit	Test configur ation	Value	Comment
Active cell		1, 2, 3	E-UTRAN Cell 1 and NR Cell 2	
Neighbour cell		1, 2, 3	NR Cell 3	Cell to be identified.
RF Channel Number		1, 2, 3	1: Cell 1 2: Cell 2 and Cell 3	
SSB configuration		1 2 3	SSB.1 FR1 SSB.1 FR1 SSB.2 FR1	
SMTC configuration		1 2 3	SMTC.2 SMTC.1 SMTC.1	
A3-Offset	dB	1, 2, 3	-4.5	
CP length		1, 2, 3	Normal	
Hysteresis	dB	1, 2, 3	0	
Time To Trigger	S	1, 2, 3	0	
Filter coefficient		1, 2, 3	0	L3 filtering is not used
DRX		1, 2, 3	N/A	OFF
Time offset between PCell and PSCell		1, 2, 3	3 μs	Synchronous EN-DC
Time offset between serving and neighbour cells		1	3 ms	Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		2	3 μs	Synchronous cells
		3	3 μs	Synchronous cells
T1	S	1, 2, 3	5	
T2	s	1, 2, 3	5	

Table A.4.6.1.1.2-3: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting without gap for PSCell in FR1

Parameter	Unit	Test	Cell 2				II 3
		configuration	T1	T2	T1	T2	
TDD configuration		1	N/A TDDConf.1.1		N/A		
		2			TDDConf.1.1		
		3	TDDC	TDDConf.2.1		onf.2.1	
PDSCH RMC		1	SR.1.	1 FDD	N/A		
configuration		2	SR.1.	1 TDD			
		3	SR.2.	1 TDD	1		
RMSI CORESET		1	CR.1.1 FDD		CR.1.1 FDD		
RMC		2	CR.1.1 TDD		CR.1.1 TDD		
configuration		3	CR.2.1 TDD		CR.2.1 TDD		
Dedicated		1	CCR.1.1 FDD		CCR.1.1 FDD		
CORESET RMC		2	CCR.1.1 TDD CCR.2.1 TDD		CCR.1	.1 TDD	
configuration		3			CCR.2.1 TDD		
OCNG Patterns		1, 2, 3	OP.1		OP.1		
TRS configuration	_	1	TRS.1.1 FDD TRS.1.1 TDD TRS.1.2 TDD		N/	/A	
		2			N/A		
		3			N/A		

Initial BWP		1, 2, 3	DLBV	VP.0.1	DLBW	/P.0.1	
configuration			ULBWP.0.1 ULBWP.0.1			/P.0.1	
Active DL BWP		1, 2, 3	DLBWP.1.1 DLBWP.1.1			/P.1.1	
configuration							
Active UL BWP		1, 2, 3	ULBWP.1.1 ULBWP.1.1			/P.1.1	
configuration							
RLM-RS		1, 2, 3	SSB SSB			SB	
$N_{oc}$ Note 2	dBm/SCS	1	-98				
1 voc		2	-98				
		3		-	95		
$N_{oc}$ Note 2	dBm/15 kHz	1	-98				
1 oc		2					
		3					
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	1	4	-1.46	-Infinity	-1.46	
$\mathbf{L}_{\mathrm{s}}/1_{\mathrm{ot}}$		2					
		3					
$\hat{E}_s/N_{oc}$	dB	1	4	4	-Infinity	4	
$E_s/IV_{oc}$		2					
		3					
SS-RSRP Note 3	dBm/SCS kHz	1	-94	-94	-Infinity	-94	
		2	-94	-94	-Infinity	-94	
		3	-91	-91	-Infinity	-91	
lo	dBm/9.36 MHz	1	-64.60	-62.25	-64.60	-62.25	
	dBm/9.36 MHz	2	-64.60	-62.25	-64.60	-62.25	
	dBm/38.16 MHz	3	-58.50	-56.16	-58.50	-56.16	
Propagation		1, 2, 3	AWGN				
Condition							

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

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

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

## A.4.6.1.1.3 Test Requirements

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 800 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.4.6.1.2 EN-DC event triggered reporting tests without gap under DRX

#### A.4.6.1.2.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the TDD intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2.

## A.4.6.1.2.2 Test parameters

Configuration

2

3

Note:

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell. The test parameters for PSCell are given in Table A.4.6.1.2.1-1, A.4.6.1.2.1-2, A.4.6.1.2.1-3 and A.4.6.1.2.1-4 below and the test parameters and applicability for the E-UTRAN cell are defined in A.3.7.2. In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

Description

Table A.4.6.1.2.2-1: Supported test configurations

15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode

15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode

30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode

Table A.4.6.1.2.2-2: General test parameters for EN-DC intra-frequency event triggered reporting
without gap for PSCell in FR1 with DRX

The UE is only required to be tested in one of the supported test configurations.

Parameter	Unit Test Value configur		lue	Comment			
		ation	Test 1	Test 2			
Active cell		1, 2, 3	E-UTRAN Ce	II 1 and NR			
			Cell 2				
Neighbour cell		1, 2, 3	NR Cell 3		Cell to be identified.		
RF Channel Number		1, 2, 3	1: Cell 1				
			2: Cell 2 and	Cell 3			
SSB configuration		1	SSB.1 FR1				
		2	SSB.1 FR1				
		3	SSB.2 FR1				
SMTC configuration		1	SMTC.2				
		2	SMTC.1				
		3	SMTC.1				
A3-Offset	dB	1, 2, 3	-4.5				
CP length		1, 2, 3	Normal				
Hysteresis	dB	1, 2, 3	0				
Time To Trigger	S	1, 2, 3	0				
Filter coefficient		1, 2, 3	0		L3 filtering is not used		
DRX		1, 2, 3	DRX.1	DRX.2			
Time offset between PCell and PSCell		1, 2, 3	3 μs		Synchronous EN-DC		
Time offset between serving		1	3 ms		Asynchronous cells.		
and neighbour cells					The timing of Cell 3 is 3ms later than the timing of Cell 2.		
		2	3 μs		Synchronous cells		
		3	3 μs		Synchronous cells		
T1	s	1, 2, 3	5				
T2	S	1, 2, 3	5	10			

Table A.4.6.1.2.2-3: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting without gap for PSCell in FR1 with DRX

Parameter	Unit	Test	Cell 2		Cell 3		
		configuration	T1	T2	T1	T2	
TDD configuration		1	N/A		N/A		
		2	TDDConf.1.1 TDDConf.2.1		TDDConf.1.1		
		3			TDDConf.2.1		
PDSCH RMC		1	SR.1.1 FDD		N/A		
configuration		2	SR.1.	1 TDD	i		
		3	SR.2.	1 TDD			
RMSI CORESET		1	CR.1.	1 FDD	CR.1.1 FDD		
RMC		2	CR.1.	1 TDD	CR.1.1 TDD		
configuration		3	CR.2.	1 TDD	CR.2.	CR.2.1 TDD	
Dedicated		1	CCR.1	.1 FDD	CCR.1	.1 FDD	
CORESET RMC		2	CCR.1	.1 TDD	CCR.1	.1 TDD	
configuration		3		.1 TDD	CCR.2		
OCNG Patterns		1, 2, 3	OF		OF		
TRS configuration		1		.1 FDD		/A	
5		2		.1 TDD		/A	
		3		.2 TDD	N/A		
Initial BWP		1, 2, 3		/P.0.1	DLBWP.0.1		
configuration		., _, •	ULBWP.0.1		ULBWP.0.1		
Active DL BWP		1, 2, 3		/P.1.1	DLBW		
configuration		-, -, -					
Active UL BWP		1, 2, 3	ULBWP.1.1 ULBWP.1.1			/P.1.1	
configuration							
RLM-RS		1, 2, 3	SSB SSB			SB	
$N_{oc}$ Note 2	dBm/SCS	1	-98 -98				
1 voc		2					
		3			95		
$N_{oc}$ Note 2	dBm/15 kHz	1	-98				
- · oc		2					
		3					
$\hat{E}_{s}/I_{ot}$	dB	1	4	-1.46	-Infinity	-1.46	
Z <sub>s</sub> / T <sub>ot</sub>		2					
		3					
$\hat{E}_s/N_{oc}$	dB	1	4	4	-Infinity	4	
= s / 1 · oc		2					
		3					
SS-RSRP Note 3	dBm/SCS kHz	1	-94	-94	-Infinity	-94	
		2	-94	-94	-Infinity	-94	
		3	-91	-91	-Infinity	-91	
lo	dBm/9.36 MHz	1	-64.60	-62.25	-64.60	-62.25	
	dBm/9.36 MHz	2	-64.60	-62.25	-64.60	-62.25	
	dBm/38.16 MHz	3	-58.50	-56.16	-58.50	-56.16	
Propagation Condition		1, 2, 3	AWGN				

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

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

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

## A.4.6.1.2.2 Test Requirements

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 6400 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.4.6.1.3 EN-DC event triggered reporting tests with per-UE gaps under non-DRX

## A.4.6.1.3.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the TDD intra-frequency cell search requirements in clause 9.2.6.2 and 9.2.6.3.

## A.4.6.1.3.2 Test parameters

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell. The test parameters for PSCell are given in Table A.4.6.1.3.1-1 and A.4.6.1.3.1-2 below and the test parameters and applicability for the E-UTRAN cell are defined in A.3.7.2. In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

There are two BWPs configured in Cell 2, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 2. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

 Configuration
 Description

 1
 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode

 2
 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode

 3
 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode

 Note:
 The UE is only required to be tested in one of the supported test configurations.

Table A.4.6.1.3.2-1: Supported test configurations

Table A.4.6.1.3.2-2: General test parameters for EN-DC intra-frequency event triggered reporting with per-UE gaps for PSCell in FR1

Parameter	Unit	Test configur ation	Value	Comment
Active cell		1, 2, 3	E-UTRAN Cell 1 and NR Cell 2	
Neighbour cell		1, 2, 3	NR Cell 3	Cell to be identified.
RF Channel Number		1, 2, 3	1: Cell 1 2: Cell 2 and Cell 3	
Measurement gap type		1, 2, 3	Per-UE gaps	
Measurement gap repitition periodicity	ms	1, 2, 3	40	
Measurement gap length	ms	1, 2, 3	6	
Measurement gap offset	ms	1, 2, 3	39	
SSB configuration		1	SSB.1 FR1	
		2	SSB.1 FR1	
		3	SSB.2 FR1	
SMTC configuration		1	SMTC.2	
		2	SMTC.1	
		3	SMTC.1	
CSI-RS parameters		1	CSI-RS.1.2 FDD	
		2	CSI-RS.1.2 TDD	
		3	CSI-RS.2.2 TDD	
A3-Offset	dB	1, 2, 3	-4.5	
CP length		1, 2, 3	Normal	
Hysteresis	dB	1, 2, 3	0	
Time To Trigger	S	1, 2, 3	0	
Filter coefficient		1, 2, 3	0	L3 filtering is not used
DRX		1, 2, 3	N/A	OFF
Time offset between PCell and PSCell		1, 2, 3	3 μs	Synchronous EN-DC
Time offset between serving and neighbour cells		1	3 ms	Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		2	3 μs	Synchronous cells
		3	3 μs	Synchronous cells
T1	s	1, 2, 3	5	
T2	S	1, 2, 3	5	

Table A.4.6.1.3.2-3: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting with per-UE gaps for PSCell in FR1

Parameter	Unit			Cell 2		Cell 3	
		configuration	T1	T2	T1	T2	
TDD configuration		1	N/A TDDConf.1.1 TDDConf.2.1		N/A		
		2			TDDConf.1.1		
		3			TDDConf.2.1		
PDSCH RMC		1	SR.1.1 FDD SR.1.1 TDD SR.2.1 TDD		N/	/A	
configuration		2					
		3					
RMSI CORESET		1	CR.1.1 FDD		CR.1.1 FDD		
RMC		2			CR.1.	1 TDD	
configuration		3			CR.2.1 TDD		

Dedicated		1	CCR.1	.1 FDD	CCR.1	.1 FDD
CORESET RMC		2	CCR.1	.1 TDD	CCR.1	.1 TDD
configuration		3	CCR.2	.1 TDD	CCR.2	.1 TDD
OCNG Patterns		1, 2, 3	OF	P.1	OF	P.1
TRS configuration		1	TRS.1.1 FDD N/A			
		2	TRS.1	.1 TDD	N/	/A
		3	TRS.1	.2 TDD	N.	/A
Initial BWP		1, 2, 3		VP.0.1	DLBW	
configuration		, , -		VP.0.1	ULBW	
Active DL BWP		1, 2, 3		√P.1.2	DLBW	
configuration		, ,				
Active UL BWP		1, 2, 3	ULBV	VP.1.2	ULBV	/P.1.1
configuration						
RLM-RS		1, 2, 3	CSI	-RS	SS	SB
$N_{oc}$ Note 2	dBm/SCS	1	-98			
1 oc		2	-98			
		3	-95			
$N_{oc}$ Note 2	dBm/15 kHz	1		-	98	
1 oc		2				
		3				
$\hat{E}_{s}/I_{ot}$	dB	1	4	-1.46	-Infinity	-1.46
s/ ot		2				
		3				
$\hat{E}_s/N_{oc}$	dB	1	4	4	-Infinity	4
$L_s/V_{oc}$		2				
		3				
SS-RSRP Note 3	dBm/SCS kHz	1	-94	-94	-Infinity	-94
		2	-94	-94	-Infinity	-94
		3	-91	-91	-Infinity	-91
lo	dBm/9.36 MHz	1	-64.60	-62.25	-64.60	-62.25
	dBm/9.36 MHz	2	-64.60	-62.25	-64.60	-62.25
	dBm/38.16 MHz	3	-58.50	-56.16	-58.50	-56.16
Propagation		1, 2, 3	AWGN			
Condition						

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

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

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

## A.4.6.1.3.3 Test Requirements

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 800 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.4.6.1.4 EN-DC event triggered reporting tests with per-UE gaps under DRX

## A.4.6.1.4.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clause 9.2.6.2 and 9.2.6.3.

## A.4.6.1.4.2 Test parameters

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell. The test parameters for PSCell are given in Table A.4.6.1.4.2-1, A.4.6.1.4.2-2, A.4.6.1.4.2-3 A.4.6.1.4.2-4 and A.4.6.1.4.2-5 below and the test parameters and applicability for the E-UTRAN cell are defined in A.3.7.2. In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

There are two BWPs configured in Cell 2, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 2. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

Table A.4.6.1.4.2-1: Supported test configurations

Configuration	Description			
1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode			
2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode			
3	30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode			
Note: The UE is only required to be tested in one of the supported test configurations.				

Table A.4.6.1.4.2-2: General test parameters for EN-DC intra-frequency event triggered reporting with per-UE gaps for PSCell in FR1 with DRX

Parameter	Unit	Test	Value		Comment
		configur ation	Test 1	Test 2	
Active cell		1, 2, 3	E-UTRAN Ce Cell 2	II 1 and NR	
Neighbour cell		1, 2, 3	NR Cell 3		Cell to be identified.
RF Channel Number		1, 2, 3	1: Cell 1 2: Cell 2 and	Cell 3	
Measurement gap type		1, 2, 3	Per-UE gaps		
Measurement gap repitition periodicity	ms	1, 2, 3	40		
Measurement gap length	ms	1, 2, 3	6		
Measurement gap offset	ms	1, 2, 3	39		
SSB configuration		1	SSB.1 FR1		
		2	SSB.1 FR1		
		3	SSB.2 FR1		
SMTC configuration		1	SMTC.2		
		2	SMTC.1		
		3	SMTC.1		

CSI-RS parameters		1	CSI-RS.1.2 F	DD	
·		2	CSI-RS.1.2 T	DD	
		3	CSI-RS.2.2 T	DD	
A3-Offset	dB	1, 2, 3	-4.5		
CP length		1, 2, 3	Normal		
Hysteresis	dB	1, 2, 3	0		
Time To Trigger	S	1, 2, 3	0		
Filter coefficient		1, 2, 3	0		L3 filtering is not used
DRX		1, 2, 3	DRX.1	DRX.2	
Time offset between PCell and PSCell		1, 2, 3	3 μs		Synchronous EN-DC
Time offset between serving and neighbour cells		1	3 ms		Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		2	3 μs		Synchronous cells
		3	3 μs		Synchronous cells
T1	s	1, 2, 3	5		
T2	S	1, 2, 3	5	10	

Table A.4.6.1.4.2-3: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting with per-UE gaps for PSCell in FR1 with DRX

Parameter	Unit	Test	Cell 2		Ce	II 3
		configuration	T1	T2	T1	T2
TDD configuration		1	N	/A	N	/A
		2	TDDC	onf.1.1	TDDC	onf.1.1
		3	TDDC	onf.2.1	TDDC	onf.2.1
PDSCH RMC		1		1 FDD	N	/A
configuration		2	SR.1.	1 TDD		
		3	SR.2.	1 TDD		
RMSI CORESET		1		1 FDD		1 FDD
RMC		2	CR.1.	1 TDD	CR.1.	1 TDD
configuration		3	CR.2.	1 TDD	CR.2.	1 TDD
Dedicated		1	CCR.1	.1 FDD	CCR.1	.1 FDD
CORESET RMC		2	CCR.1	.1 TDD		.1 TDD
configuration		3	CCR.2	.1 TDD	CCR.2.1 TDD	
OCNG Patterns		1, 2, 3	_	⊃.1	OP.1	
TRS configuration		1		.1 FDD	N/A	
		2	TRS.1	.1 TDD	N/A	
		3	TRS.1	.2 TDD	N/A	
Initial BWP		1, 2, 3	DLBV	VP.0.1	DLBV	√P.0.1
configuration				VP.0.1		/P.0.1
Active DL BWP		1, 2, 3	DLBV	VP.1.2	DLBV	/P.1.1
configuration					ļ	
Active UL BWP		1, 2, 3	ULBV	VP.1.2	ULBWP.1.1	
configuration		4.0.0				
RLM-RS	ID (000	1, 2, 3	CS	I-RS		SB
$N_{oc}$ Note 2	dBm/SCS	1	-98			
		3	-98			
3.7	dBm/15 KHz	1	-95			
$N_{oc}$ Note 2	UDIII/ IƏ NAZ	2	-98			
		3	<del> </del>			
-	dB	1	4 -1.46 -Int		-Infinity	-1.46
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	uБ	2	1 7	-1.40	-11111111ty	-1.40
			1		1	

		3				
$\hat{E}_s/N_{oc}$	dB	1	4	4	-Infinity	4
$L_s/V_{oc}$		2				
		3				
SS-RSRP Note 3	dBm/SCS KHz	1	-94	-94	-Infinity	-94
		2	-94	-94	-Infinity	-94
		3	-91	-91	-Infinity	-91
lo	dBm/9.36 MHz	1	-64.60	-62.25	-64.60	-62.25
	dBm/9.36 MHz	2	-64.60	-62.25	-64.60	-62.25
	dBm/38.16 MHz	3	-58.50	-56.16	-58.50	-56.16
Propagation		1, 2, 3		A۷	VGN	
Condition						

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2

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

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

## A.4.6.1.4.3 Test Requirements

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 6400 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.4.6.1.5 EN-DC event triggered reporting tests without gap under non-DRX with SSB index reading

#### A.4.6.1.5.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the FDD intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2.

### A.4.6.1.5.2 Test parameters

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell. The test parameters for FDD PSCell are given in Table A.4.6.1.5.1-1 and A.4.6.1.5.1-2 below and the test parameters and applicability for the E-UTRAN cell are defined in A.3.7.2. In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

## Table A.4.6.1.5.2-1: Supported test configurations

Configuration	Description
1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode

Table A.4.6.1.5.2-2: General test parameters for EN-DC intra-frequency event triggered reporting without gap for FDD PSCell in FR1 with SSB index reading

Parameter	Unit	Test configur ation	Value	Comment
Active cell		1	E-UTRAN Cell 1 and NR Cell 2	
Neighbour cell		1	NR Cell 3	Cell to be identified.
RF Channel Number		1	1: Cell 1 2: Cell 2 and Cell 3	
SSB configuration		1	SSB.1 FR1	
SMTC configuration		1	SMTC.2	
A3-Offset	dB	1	-4.5	
CP length		1	Normal	
Hysteresis	dB	1	0	
Time To Trigger	s	1	0	
Filter coefficient		1	0	L3 filtering is not used
DRX		1	N/A	OFF
Time offset between PCell and PSCell		1	3 μs	Synchronous EN-DC
Time offset between serving and neighbour cells		1	3 ms	Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
T1	S	1	5	
T2	S	1	5	

Table A.4.6.1.5.1-3: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting without gap for FDD PSCell in FR1 with SSB index reading

Parameter	Unit	Test	Ce	Cell 2 T1 T2		Cell 3	
		configuration	T1			T2	

TDD configuration		1	N	/A	N,	/A
PDSCH RMC		1	SR.1.	1 FDD	N,	/A
configuration						
RMSI CORESET		1	CR.1.	1 FDD	CR.1.	1 FDD
RMC						
configuration						
Dedicated		1	CCR.1	.1 FDD	CCR.1	.1 FDD
CORESET RMC						
configuration						
OCNG Patterns		1	OF		OF	
TRS configuration		1	TRS.1	1 FDD	N,	/A
Initial BWP		1	DLBV		DLBW	
configuration			ULBV	/P.0.1	ULBW	/P.0.1
Active DL BWP		1	DLBV	/P.1.1	DLBW	/P.1.1
configuration						
Active UL BWP		1	ULBWP.1.1 ULBWP.1.1		/P.1.1	
configuration						
RLM-RS		1	SS	SB	SS	SB
$N_{oc}$ Note 2	dBm/SCS	1	-98			
$N_{oc}$ Note 2	dBm/15 kHz	1	-98			
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	1	4 -1.46		-Infinity	-1.46
$\hat{E}_s/N_{oc}$	dB	1	4	4	-Infinity	4
SS-RSRP Note 3	dBm/SCS kHz	1	-94	-94	-Infinity	-94
lo	dBm/9.36 MHz	1	-64.60	-62.25	-64.60	-62.25
Propagation		1	AWGN			
Condition						

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

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

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

## A.4.6.1.5.3 Test Requirements

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE is required to read the neighbour cell SSB index and report the acquired SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.4.6.1.6 EN-DC event triggered reporting tests with SSB index reading with per-UE gaps

## A.4.6.1.6.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clause 9.2.6.2 and 9.2.6.3.

## A.4.6.1.6.2 Test parameters

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell. The test parameters for PSCell are given in Table A.4.6.1.6.2-1 A.4.6.1.6.2-2 and A.4.6.1.6.2-3 below and the test parameters and applicability for the E-UTRAN cell are defined in A.3.7.2. In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

There are two BWPs configured in Cell 2, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 2. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

Table A.4.6.1.6.2-1: Supported test configurations

Configuration	Description
1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode

Table A.4.6.1.6.2-2: General test parameters for EN-DC intra-frequency event triggered reporting with gap for PSCell in FR1 with SSB index reading

Parameter	Unit	Test configur ation	Value	Comment
Active cell		1	E-UTRAN Cell 1 and NR Cell 2	
Neighbour cell		1	NR Cell 3	Cell to be identified.
RF Channel Number		1	1: Cell 1 2: Cell 2 and Cell 3	
Measurement gap type		1	Per-UE gaps	
Measurement gap repitition periodicity	ms	1	40	
Measurement gap length	ms	1	6	
Measurement gap offset	ms	1	39	
SSB configuration		1	SSB.1 FR1	
SMTC configuration		1	SMTC.2	
CSI-RS parameters		1	CSI-RS.1.2 FDD	
A3-Offset	dB	1	-4.5	
CP length		1	Normal	
Hysteresis	dB	1	0	
Time To Trigger	S	1	0	
Filter coefficient		1	0	L3 filtering is not used
DRX		1	N/A	OFF
Time offset between PCell and PSCell		1	3 μs	Synchronous EN-DC
Time offset between serving and neighbour cells		1	3 ms	Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
T1	S	1	5	
T2	S	1	5	

Table A.4.6.1.6.2-3: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting with gap for PSCell in FR1 with SSB index reading

Parameter	Unit	Test	Ce	II 2	Ce	II 3
		configuration	T1	T2	T1	T2

TDD configuration		1	N	/A	N/	/A	
PDSCH RMC		1	SR.1.	SR.1.1 FDD N/A			
configuration							
RMSI CORESET		1	CR.1.1 FDD CR.1.1 F			1 FDD	
RMC							
configuration							
Dedicated		1	CCR.1	.1 FDD	CCR.1	.1 FDD	
CORESET RMC							
configuration							
OCNG Patterns		1	OF		OF		
TRS configuration		1	TRS.1	.1 FDD	N/	/A	
Initial BWP		1	DLBV	/P.0.1	DLBW	/P.0.1	
configuration			ULBV	ULBWP.0.1 ULBWP.0.1			
Active DL BWP		1	DLBWP.1.2 DLBWP.1.1			/P.1.1	
configuration							
Active UL BWP		1	ULBV	ULBWP.1.1 ULBWP.1.1			
configuration							
RLM-RS		1	CSI	-RS	SS	SB	
$N_{oc}^{}$ Note 2	dBm/SCS	1		-	98		
$N_{oc}$ Note 2	dBm/15 kHz	1		-	98		
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	1	4	4 -1.46 -Infinity -1.46		-1.46	
$\hat{E}_s/N_{oc}$	dB	1	4 4 -Infinity 4		4		
SS-RSRP Note 3	dBm/SCS kHz	1	-94 -94 -Infinity -94			-94	
lo	dBm/9.36 MHz	1	-64.60			-62.25	
Propagation		1		AWGN			
Condition							

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

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

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

## A.4.6.1.6.3 Test Requirements

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE is required to read the neighbour cell SSB index and report the acquired SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.4.6.2 Inter-frequency Measurements

## A.4.6.2.1 EN-DC event triggered reporting tests for FR1 cell without SSB time index detection when DRX is not used

## A.4.6.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 on NR RF channel 2. The test parameters and configurations are given in Tables A.4.6.2.1.1-1, A.4.6.2.1.1-2, and A.4.6.2.1.1-3.

In test 1 measurement gap pattern configuration #0 as defined in Table A.4.6.2.1.1-2 is provided for a UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table A.4.6.2.1.1-2 is provided for UE that support per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 2. Otherwise it is only required to pass test 1.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.1-1. Supported test configurations are shown in table A.4.6.2.1.1-1.

Table A.4.6.2.1.1-1: EN-DC event triggered reporting tests without SSB index reading for FR1-FR1

	Config	Description					
	1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode					
	2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode					
	LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode						
4		LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode					
	5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode					
6 LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duple		LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode					
Note 1: The UE is only required to be tested in one of the supported test configurations							
Note 2: target NR cell3 has the same SCS, BW and duplex mode as NR serving cell2							

Table A.4.6.2.1.1-2: General test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

Parameter	Unit	Test	Va	lue	Comment
		configurati	Test 1	Test 2	
		on			

E-UTRA RF Channel Number		Config 1,2,3,4,5,6		1	One E-UTRAN TDD carrier frequencies is used.				
NR RF Channel Number		Config 1,2,3,4,5,6	1	, 2	Two FR1 NR carrier frequencies is used.				
Active cell		Config 1,2,3,4,5,6	LTE Cell 1 (PCell) and NR cell 2 (PScell)						LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3,4,5,6	NR cell 3		NR cell 3 is on NR RF channel number 2.				
Gap Pattern Id		Config 1,2,3,4,5,6	0	4	As specified in clause 9.1.2-1.				
Measurement gap offset		Config 1,2,3,4,5,6	39	9					
SMTC-SSB parameters		Config 1,4	SSB.1 FR1		As specified in clause A.3.10.1				
		Config 2,5	SSB.1 FR1		As specified in clause A.3.10.1				
		Config 3,6	SSB.2 FR1		As specified in clause A.3.10.1				
A3-Offset	dB	Config 1,2,3,4,5,6	-6						
Hysteresis	dB	Config 1,2,3,4,5,6	0						
CP length		Config 1,2,3,4,5,6	Normal						
TimeToTrigger	S	Config 1,2,3,4,5,6	0						
Filter coefficient		Config 1,2,3,4,5,6	0		L3 filtering is not used				
DRX		Config 1,2,3,4,5,6	OFF		DRX is not used				
Time offset between PCell and PSCell		Config 1,2,3,4,5,6	3 μs		Synchronous EN-DC				
Time offset between serving and neighbour cells		Config 1,4	3ms		Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.				
		Config 2,3,5,6	3μs		Synchronous cells.				
T1	s	Config 1,2,3,4,5,6	5						
T2	s	Config 1,2,3,4,5,6	1	1					

Table A.4.6.2.1.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

Parameter	Unit	Test	Cell 2		(	Cell 3	
		configuratio	T1	T2	T1	T2	
		n					
NR RF Channel Number		Config		1		2	
		1,2,3,4,5,6					
Duplex mode		Config 1,4	FDD				
		Config		Т	DD		
		2,3,5,6					
BW <sub>channel</sub>	MHz	Config 1,4	10: N <sub>RB,c</sub> = 52				
		Config 2,5	10: N <sub>RB,c</sub> = 52				
		Config 3,6	40: N <sub>RB.c</sub> = 106				

BWP BW	MHz	Config 1,4			<sub>RB,c</sub> = 52	
		Config 2,5			RB,c = 52	
TDD configuration		Config 3,6	TDDC		B,c = 106	Caref 4.4
TDD configuration		Config 2,5		onf.1.1		Conf.1.1
In:the LDL DWD		Config 3,6		onf.2.1	טטו	Conf.2.1
Initial DL BWP		Config 1,2,3,4,5,6	DLBA	VP.0.1		NA
Initial UL BWP		Config 1,2,3,4,5,6	ULBV	VP.0.1		NA
Dedicated DL BWP		Config	DLBV	VP.1.1		NA
Dedicated UL BWP		1,2,3,4,5,6 Config	UI BV	VP.1.1		NA
-		1,2,3,4,5,6				
TRS configuration		Config 1,4		.1 FDD		NA
		Config 2,5		.1 TDD		NA
		Config 3,6	TRS.1	.2 TDD		NA
OCNG Patterns defined in A.3.2.1.1 (OP.1)		Config 1,2,3,4,5,6	0	P.1		OP.1
PDSCH Reference		Config 1,4		.1 FDD	<u> </u>	-
measurement channel		Config 2,5		1 TDD	+	
		•			4	
0005057.0.		Config 3,6		1 TDD		
CORESET Reference		Config 1,4		1 FDD	4	-
Channel		Config 2,5		.1 TDD		
		Config 3,6	CR2.	1 TDD	1	
SMTC configuration defined in A.3.11		Config 1,4	SM	TC.2	SI	MTC.5
		Config 2,3,5,6	SM	TC.1	SMTC.4	
PDSCH/PDCCH subcarrier	kHz	Config			15	
spacing		1,2,4,5 Config 3,6			30	
EPRE ratio of PSS to SSS		Corning 5,0			1	
EPRE ratio of PBCH DMRS						
to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to		Config		0		0
PDCCH DMRS EPRE ratio of PDSCH DMRS		1,2,3,4,5,6		0		0
to SSS						
EPRE ratio of PDSCH to						
PDSCH EPRE ratio of OCNG DMRS						
to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
Note2	dBm/15 kHz		-98 -98		-98	
Note2 $N_{oc}$	dBm/S	Config	-98 -9		-98	
	CS	1,2,4,5	2 05		-95	
CC DCDD Note 3	4D::-10	Config 3,6				
SS-RSRP Note 3	dBm/S CS	Config 1,2,4,5	-94	-94	-Infinity	-91
		Config 3,6	-91	-91	-Infinity	-88
$\hat{\mathbf{E}}_{\mathrm{s}}/\mathbf{I}_{\mathrm{ot}}$	dB	Config 1,2,3,4,5,6	4	4	-Infinity	7

$\hat{E}_s/N_{oc}$	dB	Config	4	4	-Infinity	7
		1,2,3,4,5,6				
Io <sup>Note3</sup>	dBm/9.	Config	-64.59	-64.59	-70.05	-62.26
	36MHz	1,2,4,5				
	dBm/38	Config 3,6	-58.49	-58.49	-63.94	-56.15
	.16MHz					
Propagation Condition		Config		AV	/GN	
		1,2,3,4,5,6				

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

## A.4.6.2.1.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 760 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.4.6.2.2 EN-DC event triggered reporting tests for FR1 cell without SSB time index detection when DRX is used

## A.4.6.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 on NR RF channel 2. The test parameters and configurations are given in Tables A.4.6.2.2.1-1, A.4.6.2.2.1-2, and A.4.6.2.2.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.4.6.2.2.1-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #4 as defined in Table A.4.6.2.2.1-2 is provided for UE that support per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.1-1. Supported test configurations are shown in table A.4.6.2.2.1-1.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

Table A.4.6.2.2.1-1: EN-DC event triggered reporting tests without SSB index reading for FR1-FR1

	Config	Description					
	1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode					
2 LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwid		LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode					
	3	LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode					
4		LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode					
	5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode					
6 LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD dupl		LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode					
Note 1: The UE is only required to be tested in one of the supported test configurations							
Note 2: target NR cell3 has the same SCS, BW and duplex mode as NR serving cell2							

Table A.4.6.2.2.1-2: General test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

Parameter	Unit	Test	Value				Comment		
		configurati	Test	Test	Test	Test			
		on	1	2	3	4			
E-UTRA RF Channel		Config		1			One E-UTRAN TDD carrier		
Number		1,2,3,4,5,6					frequencies is used.		
NR RF Channel		Config		1,	, 2		Two FR1 NR carrier frequencies is		
Number		1,2,3,4,5,6					used.		
Active cell		Config			Cell) and	I NR	LTE Cell 1 is on E-UTRA RF		
		1,2,3,4,5,6	cell 2 (	(PScell)			channel number 1.		
							NR Cell 2 is on NR RF channel		
							number 1.		
Neighbour cell		Config	NR ce	II 3			NR cell 3 is on NR RF channel		
		1,2,3,4,5,6					number 2.		
Gap Pattern Id		Config	0		4		As specified in clause 9.1.2-1.		
		1,2,3,4,5,6			_				
Measurement gap		Config	39		9				
offset		1,2,3,4,5,6							
SMTC-SSB parameters		Config 1,4	SSB.1	FR1			As specified in clause A.3.10.1		
		Config 2,5	SSB.1	ED1			As specified in clause A.3.10.1		
		Coming 2,5	336.1	LIXI			As specified in clause A.S. 10.1		
		Config 3,6	SSB.2	FR1			As specified in clause A.3.10.1		
		3 - , -							
A3-Offset	dB	Config	-6						
		1,2,3,4,5,6							
Hysteresis	dB	Config	0						
- -		1,2,3,4,5,6							
CP length		Config	Norma	al					
-		1,2,3,4,5,6							
TimeToTrigger	S	Config	0						
		1,2,3,4,5,6							
Filter coefficient		Config	0			L3 filtering is not used			
		1,2,3,4,5,6							
DRX	ms	Config	DRX DRX DRX DRX						As specified in clause A.3.3
		1,2,3,4,5,6	.1	.2	.1	.2			
Time offset between		Config	3 μs				Synchronous EN-DC		
PCell and PSCell		1,2,3,4,5,6							

Time offset between serving and neighbour cells		Config 1,4	3ms				Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		Config 2,3,5,6	3µs				Synchronous cells.
T1	S	Config 1,2,3,4,5,6	5				
T2	s	Config 1,2,3,4,5,6	1.1	11	1.1	11	

Table A.4.6.2.2.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

Parameter	Unit	Test	Ce	II 2		Cell 3		
		configuratio	T1	T2	T1	T2		
		n						
NR RF Channel Number		Config	•			2		
		1,2,3,4,5,6			<u> </u>			
Duplex mode		Config 1,4			FDD			
		Config			TDD			
DIM		2,3,5,6		40.	. 50			
BW <sub>channel</sub>	MHz	Config 1,4			N <sub>RB,c</sub> = 52			
		Config 2,5			$N_{RB,c} = 52$			
DIA/D DIA/		Config 3,6		40: N	<sub>RB,c</sub> = 106			
BWP BW	MHz	Config 1,4			N <sub>RB,c</sub> = 52			
		Config 2,5			N <sub>RB,c</sub> = 52			
TDD 6 "		Config 3,6	<b>TDD</b>		<sub>RB,c</sub> = 106	0 (11		
TDD configuration		Config 2,5	TDDC			Conf.1.1		
		Config 3,6	TDDC	onf.2.1	TDD	Conf.2.1		
Initial DL BWP		Config	DLBW	/P.0.1		NA		
Initial UL BWP		1,2,3,4,5,6	ULBW	/D 0 4		NIA		
		Config 1,2,3,4,5,6				NA		
Dedicated DL BWP		Config 1,2,3,4,5,6	DLBW	/P.1.1		NA		
Dedicated UL BWP		Config 1,2,3,4,5,6	ULBW	/P.1.1		NA		
TRS configuration		Config 1,4	TRS.1.	1 FDD	NA			
· ·		Config 2,5	TRS.1.	1 TDD		NA		
		Config 3,6	TRS.1.	2 TDD		NA		
OCNG Patterns defined in		Config						
A.3.2.1.1 (OP.1)		1,2,3,4,5,6	OF		,	OP.1		
PDSCH Reference		Config 1,4	SR.1.			-		
measurement channel		Config 2,5	SR.1.	1 TDD				
		Config 3,6	SR2.1	TDD				
CORESET Reference		Config 1,4	CR.1.			_		
Channel		Config 2,5	CR.1.					
		Config 3,6	CR2.1	TDD				
SMTC configuration defined in A.3.11		Config 1,4	SMTC.2		SI	MTC.5		
		Config 2,3,5,6	SMTC.1		SMTC.4			
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2,4,5	15					

20

Config 2 6

		Config 3,6			30	
EPRE ratio of PSS to SSS						
EPRE ratio of PBCH DMRS						
to SSS						
EPRE ratio of PBCH to PBCH						
DMRS						
EPRE ratio of PDCCH DMRS						
to SSS						
EPRE ratio of PDCCH to		Config				
PDCCH DMRS		1,2,3,4,5,6	(	)		0
EPRE ratio of PDSCH DMRS		1,2,0,1,0,0				
to SSS						
EPRE ratio of PDSCH to						
PDSCH						
EPRE ratio of OCNG DMRS						
to SSS(Note 1)						
EPRE ratio of OCNG to						
OCNG DMRS (Note 1)						
Note2 N <sub>oc</sub>	dBm/15		-98		-98	
IV <sub>OC</sub>	kHz					
Note2	dBm/S	Config	-98		-98	
$N_{oc}$	CS	1,2,4,5				
		Config 3,6	-6	95	-95	
SS-RSRP Note 3	dBm/S	Config	-94	-94	-Infinity	-91
	CS	1,2,4,5	0 1	0 1		0.
		Config 3,6	-91	-91	-Infinity	-88
$\hat{\mathbf{E}}_{\mathrm{s}}/\mathbf{I}_{\mathrm{ot}}$	dB	Config	4	4	-Infinity	7
s / ot	u.b	1,2,3,4,5,6	•		ii iii ii ii y	,
$\hat{E}_s/N_{ac}$	dB	Config	4	4	-Infinity	7
-s/- · oc	u.b	1,2,3,4,5,6	•		ii iii ii ii y	,
Io <sup>Note3</sup>	dBm/9.	Config	-64.59	-64.59	-70.05	-62.26
	36MHz	1,2,4,5	01.00	01.00	-70.03	02.20
	dBm/38	Config 3,6	-58.49	-58.49	-63.94	-56.15
	.16MHz	oomig o,o	00.10	00.10	-03.54	00.10
Propagation Condition		Config		Α'	WGN	
r ropagation Condition		1,2,3,4,5,6		, ,		
Note 1: OCNG shall be used	such that h		lv allocated a	and a consta	nt total transi	mitted power
spectral density is ac						
Note 2: Interference from oth				in the test is	s assumed to	be constant
11010 2. 111011010100 110111 011	or oone and		opoomou		s assuminou to	25 oonotant

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

Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

## A.4.6.2.2.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1080 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 10240 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1080 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 10240 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1, 2, 3 and 4 UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

A.4.6.2.3 Void

A.4.6.2.4 Void

A.4.6.2.5 EN-DC event triggered reporting tests for FR1 cell with SSB time index detection when DRX is not used

## A.4.6.2.5.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 on NR RF channel 2. The test parameters and configurations are given in Tables A.4.6.2.5.1-1, A.4.6.2.5.1-2, and A.4.6.2.5.1-3.

In test 1 measurement gap pattern configuration #0 as defined in Table A.4.6.2.5.1-2 is provided for a UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table A.4.6.2.5.1-2 is provided for UE that support per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 2. Otherwise it is only required to pass test 1.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.1-1. Supported test configurations are shown in table A.4.6.2.5.1-1.

Table A.4.6.2.5.1-1: EN-DC event triggered reporting tests without SSB index reading for FR1-FR1

Config	Description							
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode							
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode							
3	LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode							
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode							
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode							
6	LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode							
Note 1: The UE is only i	Note 1: The UE is only required to be tested in one of the supported test configurations							
Note 2: target NR cell3	, ,							

Table A.4.6.2.5.1-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection

Parameter	Unit	Test	Value		Comment
		configurati on	Test 1	Test 2	1
E-UTRA RF Channel		Config		1	One E-UTRAN TDD carrier
Number		1,2,3,4,5,6			frequencies is used.
NR RF Channel Number		Config 1,2,3,4,5,6	1,	, 2	Two FR1 NR carrier frequencies is used.
Active cell		Config 1,2,3,4,5,6	LTE Cell 1 (PCell) and NR cell 2 (PScell)		LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3,4,5,6	NR cell 3		NR cell 3 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3,4,5,6	0	4	As specified in clause 9.1.2-1.
Measurement gap offset		Config 1,2,3,4,5,6	39	9	
SMTC-SSB parameters		Config 1,4	SSB.1 FR1		As specified in clause A.3.10.1
		Config 2,5	SSB.1 FR1		As specified in clause A.3.10.1
		Config 3,6	SSB.2 FR1		As specified in clause A.3.10.1
A3-Offset	dB	Config 1,2,3,4,5,6	-6		
Hysteresis	dB	Config 1,2,3,4,5,6	0		
CP length		Config 1,2,3,4,5,6	Normal		
TimeToTrigger	S	Config 1,2,3,4,5,6	0		
Filter coefficient		Config 1,2,3,4,5,6	0		L3 filtering is not used
DRX		Config 1,2,3,4,5,6	OFF		DRX is not used
Time offset between PCell and PSCell		Config 1,2,3,4,5,6	3 μs		Synchronous EN-DC
Time offset between serving and neighbour cells		Config 1,4	3ms		Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		Config 2,3,5,6	3μs		Synchronous cells.
T1	S	Config 1,2,3,4,5,6	5		
T2	S	Config 1,2,3,4,5,6	1.1	1	

Table A.4.6.2.5.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection

Parameter	Unit	Test	Cell 2		Cell 3		
		configuratio	T1	T2	T1	T2	
		n					
NR RF Channel Number		Config	1		1 2		2
		1,2,3,4,5,6					

Duplex mode		Config 1,4	F	-DD
•		Config		rdd .
		2,3,5,6		
BWchannel	MHz	Config 1,4		<sub>RB,c</sub> = 52
		Config 2,5	10: N	<sub>RB,c</sub> = 52
		Config 3,6		RB,c = 106
BWP BW	MHz	Config 1,4		<sub>RB,c</sub> = 52
		Config 2,5		<sub>RB,c</sub> = 52
TDD configuration		Config 3,6		RB,c = 106 TDDConf.1.1
TDD configuration		Config 2,5	TDDConf.1.1	
		Config 3,6	TDDConf.2.1	TDDConf.2.1
Initial DL BWP		Config 1,2,3,4,5,6	DLBWP.0.1	NA
Initial UL BWP		Config 1,2,3,4,5,6	ULBWP.0.1	NA
Dedicated DL BWP		Config 1,2,3,4,5,6	DLBWP.1.1	NA
Dedicated UL BWP		Config 1,2,3,4,5,6	ULBWP.1.1	NA
TRS configuration		Config 1,4	TRS.1.1 FDD	NA
The comigaration		Config 2,5	TRS.1.1 TDD	NA NA
		Config 3,6	TRS.1.2 TDD	NA NA
OCNG Patterns defined in		Config		
A.3.2.1.1 (OP.1)		1,2,3,4,5,6	OP.1	OP.1
PDSCH Reference		Config 1,4	SR.1.1 FDD	-
measurement channel		Config 2,5	SR.1.1 TDD	
		Config 3,6	SR2.1 TDD	
CORESET Reference		Config 1,4	CR.1.1 FDD	_
Channel		Config 2,5	CR.1.1 TDD	
		Config 3,6	CR2.1 TDD	
SMTC configuration defined in A.3.11		Config 1,4	SMTC.2	SMTC.5
		Config 2,3,5,6	SMTC.1	SMTC.4
PDSCH/PDCCH subcarrier	kHz	Config		15
spacing		1,2,4,5 Config 3,6		30
EPRE ratio of PSS to SSS				
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS		Config 1,2,3,4,5,6	0	0
EPRE ratio of PDSCH DMRS to SSS		1,2,0,7,0,0		
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS(Note 1)				
EPRE ratio of OCNG to OCNG DMRS (Note 1)				
Note2	dBm/15		-98	-98
$N_{oc}$	kHz			

Note2 N <sub>ac</sub>	dBm/S	Config	-98			-98
· oc	CS	1,2,4,5				
		Config 3,6	-(	95	-95	
SS-RSRP Note 3	dBm/S CS	Config 1,2,4,5	-94	-94	-Infinity	-91
		Config 3,6	-91	-91	-Infinity	-88
$\hat{ extbf{E}}_{ ext{ iny s}}/ extbf{I}_{ ext{ iny ot}}$	dB	Config 1,2,3,4,5,6	4 4		-Infinity	7
$\hat{E}_s/N_{oc}$	dB	Config 1,2,3,4,5,6	4	4	-Infinity	7
Io <sup>Note3</sup>	dBm/9. 36MHz	Config 1,2,4,5	-64.59	-64.59	-70.05	-62.26
	dBm/38 .16MHz	Config 3,6	-58.49	-58.49	-63.94	-56.15
Propagation Condition		Config 1,2,3,4,5,6		A	WGN	

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

## A.4.6.2.5.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1040 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 880 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.4.6.2.6 EN-DC event triggered reporting tests for FR1 cell with SSB time index detection when DRX is used

## A.4.6.2.6.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 on NR RF channel 2. The test parameters and configurations are given in Tables A.4.6.2.6.1-1, A.4.6.2.6.1-2, and A.4.6.2.6.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.4.6.2.6.1-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #4 as defined in Table

A.4.6.2.6.1-2 is provided for UE that support per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.1-1. Supported test configurations are shown in table A.4.6.2.6.1-1.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

Table A.4.6.2.6.1-1: EN-DC event triggered reporting tests without SSB index reading for FR1-FR1

	Config	Description					
	1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode					
	2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode					
	3	LTE FDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode					
	4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode					
	5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode					
	6	LTE TDD, NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode					
Note 1:	Note 1: The UE is only required to be tested in one of the supported test configurations						
Note 2:	target NR cell3 h	as the same SCS, BW and duplex mode as NR serving cell2					

Table A.4.6.2.6.1-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection

Parameter	Unit	Test	Value				Comment			
		configurati	Test	Test	Test	Test				
		on	1	2	3	4				
E-UTRA RF Channel		Config					One E-UTRAN TDD carrier			
Number		1,2,3,4,5,6					frequencies is used.			
NR RF Channel Number		Config 1,2,3,4,5,6	1, 2			Two FR1 NR carrier frequencies is used.				
Active cell		Config 1,2,3,4,5,6	LTE Cell 1 (PCell) and NR cell 2 (PScell)			INR	LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1.			
Neighbour cell		Config 1,2,3,4,5,6	NR cell 3		NR cell 3		NR cell 3			NR cell 3 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3,4,5,6	0 4			As specified in clause 9.1.2-1.				
Measurement gap offset		Config 1,2,3,4,5,6	39		9					
SMTC-SSB parameters		Config 1,4	SSB.1	FR1			As specified in clause A.3.10.1			
		Config 2,5	SSB.1	FR1			As specified in clause A.3.10.1			
		Config 3,6	SSB.2	FR1			As specified in clause A.3.10.1			
A3-Offset	dB	Config 1,2,3,4,5,6	-6							
Hysteresis	dB	Config 1,2,3,4,5,6	0							
CP length		Config 1,2,3,4,5,6	Norma	al						

TimeToTrigger	S	Config 1,2,3,4,5,6	0				
Filter coefficient		Config 1,2,3,4,5,6	0				L3 filtering is not used
DRX	ms	Config 1,2,3,4,5,6	DRX .1	DRX .2	DRX .1	DRX .2	As specified in clause A.3.3
Time offset between PCell and PSCell		Config 1,2,3,4,5,6	3 μs				Synchronous EN-DC
Time offset between serving and neighbour cells		Config 1,4	3ms				Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		Config 2,3,5,6	3µs				Synchronous cells.
T1	S	Config 1,2,3,4,5,6	5				
T2	s	Config 1,2,3,4,5,6	1.3	13.5	1.3	13.5	

Table A.4.6.2.6.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection

Parameter	Unit	Test	Ce	II 2		Cell 3
		configuratio n	T1	T2	T1	T2
NR RF Channel Number		Config		1		2
		1,2,3,4,5,6				
Duplex mode		Config 1,4			FDD	
		Config			TDD	
		2,3,5,6				
BWchannel	MHz	Config 1,4			$N_{RB,c} = 52$	
		Config 2,5			$N_{RB,c} = 52$	
		Config 3,6			N <sub>RB,c</sub> = 106	
BWP BW	MHz	Config 1,4			$N_{RB,c} = 52$	
		Config 2,5			$N_{RB,c} = 52$	
		Config 3,6		40: 1	$N_{RB,c} = 106$	
OCNG Patterns defined in		Config				
A.3.2.1.1 (OP.1)		1,2,3,4,5,6	OF	P.1	(	DP.1
PDSCH Reference		Config 1,4	SR.1.	1 FDD		-
measurement channel		Config 2,5	SR.1.	1 TDD		
		Config 3,6	SR2.	1 TDD		
CORESET Reference		Config 1,4	CR.1.	1 FDD		-
Channel		Config 2,5	CR.1.	1 TDD		
		Config 3,6	CR2.	1 TDD		
TDD configuration		Config 2,5	TDDConf.1.1			
		Config 3,6		TDDConf.2.1		
Initial DL BWP		Config 1,2,3,4,5,6		DL	BWP.0.1	
TRS configuration		Config 1,4			6.1.1 FDD	
-		Config 2,5		TRS	3.1.1 TDD	
		Config 3,6		TRS.1.2 TDD		
Initial UL BWP		Config 1,2,3,4,5,6	ULBWP.0.1			
Dedicated DL BWP		Config 1,2,3,4,5,6		DL	BWP.1.1	

Dedicated UL BWP		Config 1,2,3,4,5,6	ULBWP.1.1			
SMTC configuration defined in A.3.11		Config 1,4	SMTC.2		SMTC.5	
		Config 2,3,5,6	SMT	ΓC.1	SM	ITC.4
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2,4,5			15	
		Config 3,6			30	
EPRE ratio of PSS to SSS						
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS					0	
EPRE ratio of PDCCH to PDCCH DMRS		Config 1,2,3,4,5,6	(	)		
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)			_			
$N_{oc}$ Note2	dBm/15 kHz			98	-98	
$N_{oc}^{}$ Note2	dBm/S CS	Config 1,2,4,5	-9	98	-98	
		Config 3,6		95		-95
SS-RSRP Note 3	dBm/S CS	Config 1,2,4,5	-94	-94	-Infinity	-91
		Config 3,6	-91	-91	-Infinity	-88
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	Config 1,2,3,4,5,6	4	4	-Infinity	7
$\hat{E}_s/N_{oc}$	dB	Config 1,2,3,4,5,6			-Infinity	7
Io <sup>Note3</sup>	dBm/9. 36MHz	Config 1,2,4,5			-70.05	-62.26
	dBm/38 .16MHz	Config 3,6	-58.49	-58.49	-63.94	-56.15
Propagation Condition		Config 1,2,3,4,5,6	AWGN			

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

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

Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

## A.4.6.2.6.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1280 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 13440 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1280 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 13440 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1, 2, 3 and 4 UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

A.4.6.2.7 Void

A.4.6.2.8 Void

## A.4.6.3 L1-RSRP measurement for beam reporting

## A.4.6.3.1 SSB based L1-RSRP measurement when DRX is not used

## A.4.6.3.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5.4.1, with the testing configurations for NR cells in Table A.4.6.3.1.1-1.

ConfigDescription1LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode2LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode3LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode4LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode5LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode6LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode

The UE is only required to be tested in one of the supported test configurations

Table A.4.6.3.1.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test

## A.4.6.3.1.2 Test parameters

Note:

There are two cells in the test, E-UTRAN PCell (Cell 1) and FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.4.6.3.1.2-1 and Table A.4.6.3.1.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

Table A.4.6.3.1.2-1: General test parameters

Parameter	Config	Unit	Value
SSB GSCN	1~6		freq1
	1,4		FDD
Duplex mode	2,5		TDD
	3,6		TDD
	1,4		N/A
TDD Configuration	2,5		TDDConf.1.1
	3,6		TDDConf.2.1
	1,4		10: N <sub>RB,c</sub> = 52
BWchannel	2,5	MHz	10: N <sub>RB,c</sub> = 52
	3,6		40: N <sub>RB,c</sub> = 106
PDSCH Reference measurement	1,4		SR.1.1 FDD
channel	2,5		SR.1.1 TDD
Chaine	3,6		SR.2.1 TDD
RMSI CORESET Reference	1,4		CR.1.1 FDD
Channel	2,5		CR.1.1 TDD
Channel	3,6		CR.2.1 TDD
Dedicated CORESET Reference	1,4		CCR.1.1 FDD
Channel	2,5		CCR.1.1 TDD
Chamer	3,6		CCR.2.1 TDD
	1,4		SSB.3 FR1
SSB configuration	2,5		SSB.3 FR1
	3,6		SSB.4 FR1
OCNG Patterns	1~6		OP.1
Initial BWP Configuration	1~6		DLBWP.0.1
Illitial BWF Colliguration	1/30		ULBWP.0.1
Dedicated BWP configuration	1~6		DLBWP.1.1
_	11-10		ULBWP.1.1
SMTC configuration	1~6		SMTC.1
	1,4		TRS.1.1 FDD
TRS Configuration	2,5		TRS.1.1 TDD
	3,6		TRS.1.2 TDD

DRX configuration	1~6		Off
reportConfigType	1~6		periodic
reportQuantity	1~6		ssb-Index-RSRP
Number of reported RS	1~6		2
L1-RSRP reporting period	1~6	slot	80
T1	1~6	S	5
T2	1~6	S	1
EPRE ratio of PSS to SSS			
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH			
DMRS			
EPRE ratio of PDCCH DMRS to			
SSS			
EPRE ratio of PDCCH to PDCCH			
DMRS	1~6	dB	0
EPRE ratio of PDSCH DMRS to		d D	
SSS			
EPRE ratio of PDSCH to PDSCH			
DMRS	]		
EPRE ratio of OCNG DMRS to			
SSS <sup>Note 1</sup>	]		
EPRE ratio of OCNG to OCNG			
DMRS Note 1			
Propagation condition	1~6		AWGN

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

Table A.4.6.3.1.2-2: SSB specific test parameters

Parameter	Config	Unit	SSI	B#0	SSI	3#1
Parameter	Config	Onit	T1	T2	T1	T2
$N_{oc}$ Note2	1~6	dBm/15kHz		-94	.65	
$N_{oc}^{}$ Note2	1,2,4,5	dBm/SSB SCS		-94	.65	
1 voc	3,6	dbiii/33b 303		-91	.65	
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	1~6	dB	0	0	-Infinity	3
SSB RSRP Note3	1,2,4,5	dBm/SSB SCS	-94.65	-94.65	-Infinity	-91.65
COB NON	3,6	dBilli/OOB OOO	-91.65	-91.65	-Infinity	-88.65
lo Note3	1,2,4,5	dBm/9.36 MHz	-63.69	-63.69	-66.70	-61.93
10	3,6 dBm/38.16 MHz		-57.59	-57.59	-60.61	-55.84
$\hat{E}_s/N_{oc}$	1~6	dB	0	0	-Infinity	3

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

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

Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

## A.4.6.3.1.3 Test Requirements

The UE shall send L1-RSRP report every 80 slots. No later than 640ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1 while meeting the accuracy requirements as defined in Clause 10.1.19.1. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.4.6.3.2 SSB based L1-RSRP measurement when DRX is used

## A.4.6.3.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5.4.1, with the testing configurations for NR cells in Table A.4.6.3.2.1-1.

Config

Description

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

Table A.4.6.3.2.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test

#### A.4.6.3.2.2 Test parameters

There are two cells in the test, E-UTRAN PCell (Cell 1) and FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.4.6.3.2.2-1 and Table A.4.6.3.2.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

Parameter	Config	Unit	Value
SSB GSCN	1~6		freq1
	1,4		FDD
Duplex mode	2,5		TDD
	3,6		TDD
	1,4		N/A
TDD Configuration	2,5		TDDConf.1.1
	3,6		TDDConf.2.1
	1,4		10: N <sub>RB,c</sub> = 52
BWchannel	2,5	MHz	10: N <sub>RB,c</sub> = 52
	3,6		40: N <sub>RB,c</sub> = 106
	1,4		SR.1.1 FDD
	2.5		SR.1.1 TDD

Table A.4.6.3.2.2-1: General test parameters

PDSCH Reference measurement channel	3,6		SR.2.1 TDD
RMSI CORESET Reference	1,4		CR.1.1 FDD
	2,5		CR.1.1 TDD
Channel	3,6	1	CR.2.1 TDD
Dedicated CORESET Reference	1,4		CCR.1.1 FDD
Channel	2,5	1	CCR.1.1 TDD
Channel	3,6		CCR.2.1 TDD
	1,4		SSB.3 FR1
SSB configuration	2,5		SSB.3 FR1
	3,6		SSB.4 FR1
OCNG Patterns	1~6		OP.1
Initial BWP Configuration	1~6		DLBWP.0.1
Initial BVVI Configuration	170		ULBWP.0.1
Dedicated BWP configuration	1~6		DLBWP.1.1
			ULBWP.1.1
SMTC configuration	1~6		SMTC.1
	1,4		TRS.1.1 FDD
TRS Configuration	2,5		TRS.1.1 TDD
	3,6		TRS.1.2 TDD
DRX configuration	1~6		DRX.3
reportConfigType	1~6		periodic
reportQuantity	1~6		ssb-Index-RSRP
Number of reported RS	1~6		2
L1-RSRP reporting period	1~6	slot	80
T1	1~6	S	5
T2	1~6	S	1
EPRE ratio of PSS to SSS			
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH	1		
DMRS			
EPRE ratio of PDCCH DMRS to	1		
SSS			
EPRE ratio of PDCCH to PDCCH	1		
DMRS	4.0	ID.	
EPRE ratio of PDSCH DMRS to	1~6	dB	0
SSS			
EPRE ratio of PDSCH to PDSCH			
	_		
DMRS	-		
DMRS			
DMRS EPRE ratio of OCNG DMRS to			
DMRS EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>			

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

Downwater	Config Unit	l lait	SSB#0		SSB#1	
Parameter	Config	Unit	T1	T2	T1	T2
$N_{oc}^{$	1~6	dBm/15kHz		-94	.65	
Ŋ Note2	1,2,4,5	dBm/SSB SCS		-94	.65	
$N_{oc}^{ m Note2}$	3,6	UBIII/33B 3C3		-91	.65	
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	1~6	dB	0	0	-Infinity	3
SSB RSRP Note3	1,2,4,5	dBm/SSB SCS	-94.65	-94.65	-Infinity	-91.65
OOD NON	3,6	dbiii/oob ooo	-91.65	-91.65	-Infinity	-88.65
lo Note3	1,2,4,5	dBm/9.36 MHz	-63.69	-63.69	-66.70	-61.93
10	3,6 dBm/38.16 MHz		-57.59	-57.59	-60.61	-55.84
$\hat{E}_s/N_{oc}$	1~6	dB	0	0	-Infinity	3

Table A.4.6.3.2.2-2: SSB specific test parameters

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2

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

Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

## A.4.6.3.2.3 Test Requirements

The UE shall send L1-RSRP report every 80 slots. No later than 640ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1 while meeting the accuracy requirements as defined in Clause 10.1.19.1. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.4.6.3.3 CSI-RS based L1-RSRP measurement when DRX is not used

## A.4.6.3.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5.4.2, with the testing configurations for NR cells in Table A.4.6.3.3.1-1.

Config

Description

LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode

LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode

LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode

LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode

LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode

LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode

Table A.4.6.3.3.1-1: Applicable NR configurations for FR1 CSI-RS based L1-RSRP test

## A.4.6.3.3.2 Test parameters

<u>4</u>

6

Note:

There are two cells in the test, E-UTRAN PCell (Cell 1) and FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.4.6.3.3.2-1 and Table A.4.6.3.3.2-2 below.

The UE is only required to be tested in one of the supported test configurations

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the CSI-RS and report aperiodically. The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-RSRP on aperiodic CSI-RS resources. UE is also configured to measure L1-RSRP based on SSB. After 80ms from the beginning of the test, the DCI trigger comes in slot n (1 Config 1,2,4,5 and 8 for Config 3,6) of a frame and UE provides the report back based on the reporting configuration as defined in Table A.4.6.3.3.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM and BFD based on the SSBs.

Table A.4.6.3.3.2-1: General test parameters

Parameter	Config	Unit	Value
SSB GSCN	1~6		freq1
	1,4		FDD
Duplex mode	2,5		TDD
	3,6		TDD
	1,4		N/A
TDD Configuration	2,5		TDDConf.1.1
	3,6		TDDConf.2.1
	1,4		10: N <sub>RB,c</sub> = 52
BW <sub>channel</sub>	2,5	MHz	10: N <sub>RB,c</sub> = 52
	3,6		40: N <sub>RB,c</sub> = 106
PDSCH Reference measurement	1,4		SR.1.1 FDD
channel	2,5	1	SR.1.1 TDD
Chamile	3,6		SR.2.1 TDD
	1,4		CR.1.1 FDD
RMSI CORESET Reference Channel	2,5		CR.1.1 TDD
	3,6		CR.2.1 TDD
Dedicated CORESET Reference	1,4		CCR.1.1 FDD
Channel	2,5		CCR.1.1 TDD
Channe	3,6		CCR.2.1 TDD
	1,4	_	SSB.3 FR1
SSB configuration	2,5		SSB.3 FR1
	3,6		SSB.4 FR1
	1,4		CSI-RS 1.3 FDD
CSI-RS configuration	2,5		CSI-RS 1.3 TDD
	3,6		CSI-RS 2.3 TDD

	1	1	
OCNG Patterns	1~6		OP.1
	1,4		TRS.1.1 FDD
TRS Configuration	2,5		TRS.1.1 TDD
	3,6		TRS.1.2 TDD
Initial PWD Configuration	1~6		DLBWP.0.1
Initial BWP Configuration	1~0		ULBWP.0.1
Dedicated BWP configuration	1~6		DLBWP.1.1
Dedicated BWF configuration	170		ULBWP.1.1
SMTC configuration	1~6		SMTC.1
DRX configuration	1~6		Off
reportConfigType	1~6		aperiodic
reportQuantity	1~6		cri-RSRP
Number of reported RS	1~6		2
qcl-Info	1~6		SSB#0 for resource#0
qci-iiilo	17-0		SSB#1 for resource#1
reportSlotOffsetList	1~6	slots	26
T1	1~6	s	5
EPRE ratio of PSS to SSS			
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH			
DMRS			
EPRE ratio of PDSCH DMRS to SSS	1~6	dB	0
EPRE ratio of PDSCH to PDSCH			
DMRS			
EPRE ratio of OCNG DMRS to			
SSS <sup>Note 1</sup>	]		
EPRE ratio of OCNG to OCNG DMRS  Note 1			
Propagation condition	1~6		AWGN
Note 1: OCNO shall be used such the	4 1 41 11		

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

Table A.4.6.3.3.2-2: CSI-RS specific test parameters

Parameter	Config	Unit	CSI-RS#0	CSI-RS#1
$N_{oc}^{ m Note1}$	1~6	dBm/15kHz	-94.65	
λ/ Note1	1,2,4,5	dBm/SSB SCS	-94	.65
$N_{oc}$ Note1 3,6 dBm/SS		UDIII/33B 3C3	-91	.65
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	1~6	dB	0	3
CSI-RS RSRP	1,2,4,5	dBm/SSB SCS	-94.65	-91.65
Note2	3,6	dbii//00b 000	-91.65	-88.65
lo <sup>Note2</sup>	1,2,4,5	dBm/9.36 MHz	-63.69	-61.93
10	3,6 dBm/38.16 MHz		-57.59	-55.84

$\hat{E}_s/N_{od}$	e	1~6	dB	0	3
Note 2:			ells and noise sources no		
constant over subcarriers and time and shall be modelled as AWGN of appropriate power to				ppropriate power for	
$N_{oc}$ to be fulfilled.					
Note 3: CSI-RS RSRP and lo levels have been derived from other parameters for information					or information
	purpos	ses. They are not s	settable parameters thems	selves.	

## A.4.6.3.3.3 Test Requirements

After 80ms from the beginning of the test, the UE shall send L1-RSRP report at slot 26 from the reception of DCI triggering the L1-RSRP measurement. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1 while meeting the accuracy requirements defined in 10.1.20.1.

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

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.4.6.3.4 CSI-RS based L1-RSRP measurement when DRX is used

## A.4.6.3.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5.4.2, with the testing configurations for NR cells in Table A.4.6.3.4.1-1.

-	Config	Description
	1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
	2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
	3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
	4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
	5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
	6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note:	The UF is only re	equired to be tested in one of the supported test configurations

Table A.4.6.3.4.1-1: Applicable NR configurations for FR1 CSI-RS based L1-RSRP test

## A.4.6.3.4.2 Test parameters

There are two cells in the test, E-UTRAN PCell (Cell 1) and FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.4.6.3.4.2-1 and Table A.4.6.3.4.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the CSI-RS and report aperiodically. The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-RSRP on aperiodic CSI-RS resources. UE is also configured to measure L1-RSRP based on SSB. After 80ms from the beginning of the test, the DCI trigger comes in slot n (1 Config 1,2,4,5 and 8 for Config 3,6) of a frame and UE provides the report back based on the reporting configuration as defined in Table A.4.6.3.4.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM and BFD based on the SSBs.

Table A.4.6.3.4.2-1: General test parameters

SSB GSCN	Parameter	Config	Unit	Value
Duplex mode				freq1
TDD		1,4		FDD
TDD Configuration	Duplex mode	2,5		TDD
TDD Configuration		3,6		TDD
Section				-
1,4	TDD Configuration	2,5		
BWchannel		3,6		TDDConf.2.1
PDSCH Reference measurement channel		1,4		10: N <sub>RB,c</sub> = 52
PDSCH Reference measurement channel	BW <sub>channel</sub>	2,5	MHz	10: N <sub>RB,c</sub> = 52
PUSCH Reference measurement channel channel channel channel		3,6		40: N <sub>RB,c</sub> = 106
Channel   3.6   SR.2.1 TDD	DDCCH Deference macaurement	1,4		
S.6   SR.2.1 IDD				SR.1.1 TDD
RMSI CORESET Reference Channel	Chamie	3,6		SR.2.1 TDD
Dedicated CORESET Reference Channel		1,4		CR.1.1 FDD
Dedicated CORESET Reference Channel	RMSI CORESET Reference Channel	2,5		CR.1.1 TDD
Dedicated CORESET Reference Channel   2,5   3,6   CCR.2.1 TDD		3,6		CR.2.1 TDD
Channel	Dedicated CORECET Reference	1,4		CCR.1.1 FDD
SSB configuration		2,5	1	CCR.1.1 TDD
SSB configuration	Channel	3,6	1	CCR.2.1 TDD
SSB.4 FR1		1,4		SSB.3 FR1
SSB.4 FR1	SSB configuration	2,5		SSB.3 FR1
CSI-RS configuration   2,5   3,6   CSI-RS 1.3 TDD		3,6	1	SSB.4 FR1
3,6		1,4		CSI-RS 1.3 FDD
OCNG Patterns         1~6         OP.1           TRS Configuration         1,4         TRS.1.1 FDD           Initial BWP Configuration         1~6         DLBWP.0.1           ULBWP.0.1         ULBWP.0.1         ULBWP.0.1           Dedicated BWP configuration         1~6         DLBWP.1.1           ULBWP.1.1         ULBWP.1.1         ULBWP.1.1           SMTC configuration         1~6         SMTC.1           DRX configuration         1~6         DRX.3           reportConfigType         1~6         aperiodic           reportQuantity         1~6         cri-RSRP           Number of reported RS         1~6         2           qcl-Info         1~6         SSB#0 for resource#0           SSB#1 for resource#1         SSB#1 for resource#1           reportSlotOffsetList         1~6         s           T1         1~6         s         5           EPRE ratio of PSS to SSS         EPRE ratio of PBCH DMRS to SSS         EPRE ratio of PDCCH DMRS to SSS           EPRE ratio of PDSCH DMRS to SSS         EPRE ratio of PDSCH to PDSCH         DMRS           EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup> EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup> EPRE ratio of OCNG DCNG DMRS	CSI-RS configuration	2,5	1	CSI-RS 1.3 TDD
1,4		3,6	1	CSI-RS 2.3 TDD
TRS Configuration         2,5         TRS.1.1 TDD           Initial BWP Configuration         1~6         DLBWP.0.1 ULBWP.0.1 ULBWP.0.1           Dedicated BWP configuration         1~6         DLBWP.0.1 ULBWP.0.1           SMTC configuration         1~6         SMTC.1 ULBWP.1.1           DRX configuration         1~6         DRX.3 reportConfigType           reportConfigType         1~6         aperiodic reportQuantity           Number of reported RS         1~6         2           qcI-Info         1~6         SSB#0 for resource#0 SSB#1 for resource#1           reportSlotOffsetList         1~6         s lots         26           T1         1~6         s lots         5           EPRE ratio of PSS to SSS         EPRE ratio of PBCH DMRS to SSS         EPRE ratio of PDCCH DMRS to SSS           EPRE ratio of PDCCH DMRS to SSS         EPRE ratio of PDCCH DMRS to SSS         EPRE ratio of PDSCH to PDSCH DMRS to SSS/Note 1           EPRE ratio of OCNG DMRS to SSS/Note 1         EPRE ratio of OCNG DMRS to SSS/Note 1         EPRE ratio of OCNG DMRS to SSS/Note 1	OCNG Patterns	1~6		OP.1
3,6		1,4		TRS.1.1 FDD
Substitute	TRS Configuration	2,5		TRS.1.1 TDD
Initial BWP Configuration		3,6		TRS.1.2 TDD
Dedicated BWP configuration	Initial BWD Configuration	1~6		DLBWP.0.1
Dedicated BWP configuration   1~6	Initial BWI Configuration	11-0		
SMTC configuration	Dedicated BWP configuration	1~6		
DRX configuration         1~6         DRX.3           reportConfigType         1~6         aperiodic           reportQuantity         1~6         cri-RSRP           Number of reported RS         1~6         2           qcl-Info         1~6         SSB#0 for resource#0           reportSlotOffsetList         1~6         slots         26           T1         1~6         s         5           EPRE ratio of PSS to SSS         EPRE ratio of PBCH DMRS to SSS         EPRE ratio of PBCH to PBCH DMRS         s         5           EPRE ratio of PDCCH DMRS to SSS         EPRE ratio of PDCCH to PDCCH DMRS         aperiodic         aperiodic           EPRE ratio of PSS to SS         26         SSB#0 for resource#0         SSB#1 for resource#1           EPRE ratio of PBCH DMRS to SSS         EPRE ratio of PBCH DMRS to SSS         BPRE ratio of PBCH DMRS to SSS         1~6         dB         0           EPRE ratio of OCNG DMRS to SSSNote 1         EPRE ratio of OCNG DMRS to OCNG DMRS Note 1         BPRE ratio of OCNG to OCNG DMRS Note 1         BPRE ratio of OCNG to OCNG DMRS Note 1				
reportConfigType				
reportQuantity         1~6         cri-RSRP           Number of reported RS         1~6         2           qcl-Info         1~6         SSB#0 for resource#0           reportSlotOffsetList         1~6         slots         26           T1         1~6         s         5           EPRE ratio of PSS to SSS         EPRE ratio of PBCH DMRS to SSS         EPRE ratio of PBCH DMRS to SSS           EPRE ratio of PDCCH DMRS to SSS         EPRE ratio of PDCCH DMRS to SSS         1~6         dB         0           EPRE ratio of PDSCH to PDSCH DMRS         EPRE ratio of OCNG DMRS to SSSNote 1         EPRE ratio of OCNG DMRS to OCNG DMRS         EPRE ratio of OCNG to OCNG DMRS         Image: Constant of DMRS to SSNote 1				
Number of reported RS				
qcl-Info         1~6         SSB#0 for resource#0 SSB#1 for resource#1           reportSlotOffsetList         1~6         slots         26           T1         1~6         s         5           EPRE ratio of PSS to SSS         EPRE ratio of PBCH DMRS to SSS         EPRE ratio of PBCH DMRS to SSS           EPRE ratio of PDCCH DMRS to SSS         EPRE ratio of PDCCH DMRS to SSS         1~6         dB         0           EPRE ratio of PDSCH to PDSCH DMRS to SSSNote 1         EPRE ratio of OCNG DMRS to SSNote 1         EPRE ratio of OCNG to OCNG DMRS to SSNote 1         EPRE ratio of OCNG to OCNG DMRS to SSNote 1				
reportSlotOffsetList reportSlotOffsetList 1~6 slots 26  T1 1~6 s S  EPRE ratio of PSS to SSS EPRE ratio of PBCH DMRS to SSS EPRE ratio of PBCH to PBCH DMRS EPRE ratio of PDCCH DMRS to SSS EPRE ratio of PDCCH to PDCCH DMRS EPRE ratio of PDSCH DMRS to SSS EPRE ratio of OCNG DMRS to SSSNote 1 EPRE ratio of OCNG DMRS to SSNote 1	Number of reported RS	1~6		
reportSlotOffsetList 1~6 slots 26  T1 1~6 s 5  EPRE ratio of PSS to SSS  EPRE ratio of PBCH DMRS to SSS  EPRE ratio of PBCH to PBCH DMRS  EPRE ratio of PDCCH DMRS to SSS  EPRE ratio of PDCCH to PDCCH  DMRS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH to PDSCH  DMRS  EPRE ratio of OCNG DMRS to SSSNote 1  EPRE ratio of OCNG to OCNG DMRS  Note 1	qcl-Info	1~6		
T1	reportSlotOffsetList	1~6	slots	
EPRE ratio of PSS to SSS  EPRE ratio of PBCH DMRS to SSS  EPRE ratio of PBCH to PBCH DMRS  EPRE ratio of PDCCH DMRS to SSS  EPRE ratio of PDCCH to PDCCH  DMRS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH to PDSCH  DMRS  EPRE ratio of OCNG DMRS to SSSNote 1  EPRE ratio of OCNG to OCNG DMRS  Note 1				
EPRE ratio of PBCH DMRS to SSS  EPRE ratio of PBCH to PBCH DMRS  EPRE ratio of PDCCH DMRS to SSS  EPRE ratio of PDCCH to PDCCH  DMRS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH DDSCH  DMRS  EPRE ratio of OCNG DMRS to SSSNote 1  EPRE ratio of OCNG to OCNG DMRS  Note 1	• •	1		
EPRE ratio of PBCH to PBCH DMRS  EPRE ratio of PDCCH DMRS to SSS  EPRE ratio of PDCCH to PDCCH  DMRS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH to PDSCH  DMRS  EPRE ratio of OCNG DMRS to SSSNote 1  EPRE ratio of OCNG to OCNG DMRS  Note 1		1		
EPRE ratio of PDCCH DMRS to SSS  EPRE ratio of PDCCH to PDCCH  DMRS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH to PDSCH  DMRS  EPRE ratio of OCNG DMRS to SSSNote 1  EPRE ratio of OCNG to OCNG DMRS  Note 1		†		
EPRE ratio of PDCCH to PDCCH DMRS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH to PDSCH DMRS  EPRE ratio of OCNG DMRS to SSSNote 1  EPRE ratio of OCNG to OCNG DMRS Note 1		†		
DMRS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH to PDSCH DMRS  EPRE ratio of OCNG DMRS to SSSNote 1  EPRE ratio of OCNG to OCNG DMRS Note 1		1		
EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH to PDSCH  DMRS  EPRE ratio of OCNG DMRS to  SSSNote 1  EPRE ratio of OCNG to OCNG DMRS  Note 1				
EPRE ratio of PDSCH to PDSCH DMRS  EPRE ratio of OCNG DMRS to SSSNote 1  EPRE ratio of OCNG to OCNG DMRS Note 1		1~6	dB	0
EPRE ratio of OCNG DMRS to SSSNote 1 EPRE ratio of OCNG to OCNG DMRS Note 1	EPRE ratio of PDSCH to PDSCH	1 . Ŭ	45	
EPRE ratio of OCNG to OCNG DMRS Note 1	EPRE ratio of OCNG DMRS to	-		
Note 1		_		
Propagation condition 1~6 ΔWGN	Note 1			
1 Topagation John Awon	Propagation condition	1~6		AWGN

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

Table A.4.6.3.4.2-2: CSI-RS specific test parameters

Parameter	Config	Unit	CSI-RS#0	CSI-RS#1
Noc Note1	1~6	dBm/15kHz	-94.65	
$N_{oc}^{}$ Note1	1,2,4,5	dBm/SSB SCS	-94.65	
TV <sub>oc</sub>	3,6	UDIII/33B 3C3	-91	.65
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	1~6	dB	0	3
CSI-RS RSRP	1,2,4,5	dBm/SSB SCS	-94.65	-91.65
Note2	3,6	dbiii/33b 303	-91.65	-88.65
lo <sup>Note2</sup>	1,2,4,5	dBm/9.36 MHz	-63.69	-61.93
3,6 dBm/38.16 MHz		-57.59	-55.84	
$\hat{E}_s/N_{oc}$	1~6	dB	0	3

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

Note 3: CSI-RS RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

## A.4.6.3.4.3 Test Requirements

After 80ms from the beginning of the test, the UE shall send L1-RSRP report at slot 26 from the reception of DCI triggering the L1-RSRP measurement. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1 while meeting the accuracy requirements defined in 10.1.20.1.

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

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.4.7 Measurement Performance requirements

## A.4.7.1 SS-RSRP

# A.4.7.1.1 EN-DC Intra-frequency measurement accuracy with FR1 serving cell and FR1 target cell

## A.4.7.1.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 10.1.2.1.1 and 10.1.2.1.2 for intra-frequency measurements.

## A.4.7.1.1.2 Test parameters

In this set of test cases all NR cells are on the same carrier frequency. Supported test configurations are shown in table A.4.7.1.1.2-1. Both absolute and relative accuracy of SS-RSRP intra-frequency measurements are tested by

using the parameters in A.4.7.1.1.2-2. The configuration of cell 1 (E-UTRA PCell) is specified in clause A.3.7.2.1 In all test cases, Cell 2 is the PSCell, and Cell 3 is the target cell.

Table A.4.7.1.1.2-1: SS-RSRP Intra frequency SS-RSRP supported test configurations

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

Table A.4.7.1.1.2-2: SS-RSRP Intra frequency test parameters

Parameter		Unit	Test 1		Test 2		Test 3	
			Cell 2	Cell 3	Cell 2	Cell 3	Cell 2	Cell 3
Physical cell ID			489	0	489	0	489	0
SSB ARFCN			freq1 freq1 freq1					q1
Duplex mode	Config 1,4		FDD					
	Config 2,3,5,6		TDD					
TDD configuration	Config 1,4		Not Applicable					
	Config 2,5		TDDConf.1.1					
	Config 3,6				TDDCc			
BW <sub>channel</sub>	Config 1,4		10: N <sub>RB,c</sub> = 52					
	Config 2,5	MHz	10: N <sub>RB,c</sub> = 52					
	Config 3,6		40: N <sub>RB,c</sub> = 106					
Downlink initial BWP configuration			DLBWP.0.1					
Downlink dedicated BWP configuration			DLBWP.1.1					
Uplink initial BWP configuration			ULBWP.0.1					
Uplink dedicated BWP configuration			ULBWP.1.1					
TRS configuration	Config 1,4		TRS.1. 1 FDD	NA	TRS.1.1 FDD	NA	TRS.1. 1 FDD	NA
			TRS.1.		TRS.1.1		TRS.1.	
	Config 2,5		1 TDD	TDD NA	TDD	NA	1 TDD	NA
	Config 3,6		TRS.1. 2 TDD	NA	TRS.1.2 TDD	NA	TRS.1. 2 TDD	NA
DRX Cycle		ms	Not Applicable					
PDSCH Reference measurement channel	Config 1,4		SR.1.1	-	SR.1.1	-	SR.1.1	-
	Coming 1,4		FDD		FDD		FDD	
	Config 2,5		SR.1.1		SR.1.1		SR.1.1	
	001111g 2,0		TDD		TDD		TDD	
	Config 3,6		SR2.1		SR2.1		SR2.1	
			TDD		TDD		TDD	
RMSI CORESET Reference Channel	Config 1,4		CR.1.1 FDD		CR.1.1 FDD		CR.1.1 FDD	
			CR.1.1		CR.1.1 TDD CR2.1	CR.1.1	1	
	Config 2,5		TDD	-		-	TDD	-
			CR2.1				CR2.1	
	Config 3,6		TDD		TDD		TDD	
Control Channel RMC	0		CCR.1.		CCR.1.		CCR.1.	-
	Config 1,4		1 FDD	-	1 FDD		1 FDD	
	C6 0 F		CCR.1.		CCR.1.		CCR.1.	
	Config 2,5		1 TDD		1 TDD		1 TDD	
	Config 3,6		CCR2.1		CCR2.		CCR2.1	
	Corning 3,0		TDD		1 TDD		TDD	
SSB configuration	Config 1,4		SSB.1	SSB.1	SSB.1	SSB.1	SSB.1	SSB.1
	Johns 1,4		FR1	FR1	FR1	FR1	FR1	FR1
	Config 2,5		SSB.1 FR1	SSB.1 FR1	SSB.1 FR1	SSB.1 FR1	SSB.1 FR1	SSB.1 FR1
	0 6		SSB.2	SSB.2	SSB.2	SSB.2	SSB.2	SSB.2
	Config 3,6		FR1	FR1	FR1	FR1	FR1	FR1
Time offset with Cell 2	Config 1,4	ms	-	3	-	3	-	3

		Config 2,3,5,6	μs	-	3	-	3	-	3	
CMTC	auration.	Config 1,4	pio			SMT	C.2	L		
SMTC confi	guration	Config 2,3,5,6				SMT	C.1			
OCNG Patte						OP			· · ·	
PDSCH/PD		Config 1,2,4,5	kHz				15 kHz			
subcarrier s		Config 3,6	13.12			30k	Hz I		I	
	of PSS to SSS		-							
	of PBCH DMR of PBCH to PB		-							
	of PDCCH DM									
		PDCCH DMRS	dB	0	0	0	0	0	0	
	of PDSCH DM		1							
	of PDSCH to P									
		RS to SSS(Note 1)								
EPRE ratio	EPRE ratio of OCNG to OCNG DMRS (Note 1)						1			
	NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6									
			-					-114 -113.5		
		NR_FDD_FR1_B NR_TDD_FR1_C	1						<u>3.5</u> 13	
	Config	NR FDD FR1 D,	1	_1	106	8	38	<u> </u>	10	
	1,2,4,5	NR_TDD_FR1_D			•			-11	2.5	
		NR_FDD_FR1_E,								
		NR_TDD_FR1_E						-1	12	
		NR_FDD_FR1_G						-111		
$N_{oc}$ Note2		NR_FDD_FR1_H	dBm/15KhZ					-110.5		
00		NR_FDD_FR1_A, NR_TDD_FR1_A						-114		
		NR FDD FR1 B	1					-114 -113.5		
C		NR TDD FR1 C						-113.5		
	Config 3,6	NR FDD FR1 D,	1	Not appl	icable <sup>Note 5</sup>	_9	94			
	J - , -	NR_TDD_FR1_D				]		-112.5		
		NR_FDD_FR1_E,	1							
		NR_TDD_FR1_E	4					-112		
		NR_FDD_FR1_G						-111 110.5		
		NR_FDD_FR1_H						-110.5		
	Config 1,2,4,	5		-106		-88		Same as Noc/15kHz		
		NR FDD FR1 A,							11	
		NR_TDD_FR1_A NOTE								
3.7		NR_FDD_FR1_B	]					-110.5		
$N_{oc}^{}$ Note2		NR_TDD_FR1_C	dBm/SCS					-1		
	Config 3,6	NR_FDD_FR1_D,		Not appl	icable <sup>Note 5</sup>	-6	91	-10	9.5	
		NR_TDD_FR1_D NR_FDD_FR1_E,	-					-1	00	
		NR_FDD_FR1_E, NR_TDD_FR1_E						-1	Uð	
		NR FDD FR1 G	1					-1	08	
		NR_FDD_FR1_H	1						7.5	
$\hat{E}_{s}/I_{ot}$			dB	2.46	-5.97	2.46	-5.97	-0.01	-4.76	
$\hat{E}_s/N_{oc}$			dB	6	1	6	1	3	0	
2, 00		NR_FDD_FR1_A,						-111.00	-114.00	
		NR_TDD_FR1_A								
								110.50	110.50	
		NR_FDD_FR1_B NR_TDD_FR1_C	-					-110.50 -110.00	-113.50 -113.00	
SS-	Config	NR_FDD_FR1_D,	dBm/SCS	-100	-105	-82	-87	-109.50	-112.50	
RSRP <sup>Note3</sup>	1,2,4,5	NR TDD FR1 D	GB.11/000	100	100	52	"	100.00	1 12.50	
		NR FDD FR1 E,	1					-109.00	-112.00	
		NR_TDD_FR1_E								
		NR_FDD_FR1_G						-108.00	-111.00	
		NR_FDD_FR1_H					<u> </u>	-107.50	-110.50	

		T	1						
		NR_FDD_FR1_A, NR_TDD_FR1_A						-108.00	-111.00
		NR FDD FR1 B	1					-107.50	-110.50
		NR TDD FR1 C	1	- Not	Not			-107.00	-110.00
	Config 3,6	NR_FDD_FR1_D,	1	applicab	applicabl	-85	-90	-106.50	-109.50
		NR_TDD_FR1_D		le <sup>Note 5</sup>	e <sup>Note 5</sup>				
		NR_FDD_FR1_E,						-106.00	-109.00
		NR_TDD_FR1_E NR_FDD_FR1_G	1					-105.00	-108.00
		NR FDD FR1 H						-103.00	-107.50
		NR FDD FR1 A,			ı			-80	
		NR_TDD_FR1_A							
		NR_FDD_FR1_B	]					-79.53	
	Config	NR_TDD_FR1_C	dBm/					-79.03	
	1,2,4,5	NR_FDD_FR1_D,	9.36MHz	-70	0.09	-52	.09	-78.53	
		NR_TDD_FR1_D NR_FDD_FR1_E,	-					70	03
		NR_FDD_FR1_E,						-78.03	
		NR FDD FR1 G						-77.03	
L - Note3		NR_FDD_FR1_H	1					-76.53	
Io <sup>Note3</sup>		NR_FDD_FR1_A,						-73.94	
		NR_TDD_FR1_A							
		NR_FDD_FR1_B							.44
		NR_TDD_FR1_C	dBm/						.94
	Config 3,6	NR_FDD_FR1_D,	38.16MHz	Not appl	icable <sup>Note 5</sup>	-51	.99	-72	.44
		NR_TDD_FR1_D NR_FDD_FR1_E,						-71	04
		NR_FDD_FR1_E,						-/ 1	.94
		NR FDD FR1 G	1					-70	.94
		NR_FDD_FR1_H	1					-70.44	
Propagatio			-			AWO			
Antenna co						1x:			
NI-1- 4.	00110 1 111	1 1 1 1 1					***		

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.
- Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 5: Subtest 1 is not used when testing with 30kHz SSB SCS
- Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification

# A.4.7.1.1.3 Test Requirements

The SS-RSRP measurement accuracy for cell 2 and cell 3 shall fulfil absolute requirement in clause 10.1.2.1.1 and relative requirement in clause 10.1.2.1.2.

# A.4.7.1.2 EN-DC inter-frequency measurement accuracy with FR1 serving cell and FR1 target cell

# A.4.7.1.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 10.1.4.1.1 and 10.1.4.1.2 for inter-frequency measurements with the testing configurations in Table A.4.7.1.2.1-1.

Table A.4.7.1.2.1-1: Applicable NR configurations for FR1 inter-frequency SS-RSRP accuracy test

(	Config	Description
	1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
	2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
	3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
	4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
	5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
	6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note:	The UE is only re	equired to be tested in one of the supported test configurations on each supported band

# A.4.7.1.2.2 Test parameters

In this set of test cases there are three cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on a different frequency than the PSCell. The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 and Cell 3 are given in Table A.4.7.1.2.2-1 below. Both absolute and relative accuracy of RSRP inter-frequency measurements are tested by using the parameters in Table A.4.7.1.2.2-1. The inter-frequency measurements are supported by a measurement gap.

Table A.4.7.1.2.2-1: SS-RSRP inter-frequency test parameters

Parameter	Confin	Unit	Test	:1	Tes	t 2
	Config	Unit	Cell 2	Cell 3	Cell 2	Cell 3
SSB ARFCN	1~6		freq1	freq2	freq1	freq2
	1,4		10: N <sub>RB,0</sub>	c = 52	10: N <sub>RB</sub>	<sub>.c</sub> = 52
BW <sub>channel</sub>	2,5	MHz	10: N <sub>RB,0</sub>	c = 52	10: N <sub>RB,c</sub> = 52	
	3,6		40: N <sub>RB,c</sub> = 106		40: N <sub>RB,0</sub>	; = 106
Gap pattern ID			0		0	
	1,4		FDI		FD	
Duplex mode	2,5		TDI		TD	
	3,6		TDI		TD	
	1,4		N/A		N/A	
TDD configuration	2,5		TDDCoi		TDDCo	
	3,6		TDDCoi	nf.2.1	TDDCo	nf.2.1
	1,4		SR.1.1 FDD		SR.1.1 FDD	
PDSCH Reference measurement channel	2,5		SR.1.1 TDD	-	SR.1.1 TDD	-
	3,6		SR.2.1 FDD		SR.2.1 FDD	
	1,4		CR.1.1 FDD	-	CR.1.1 FDD	-
RMSI CORESET Reference Channel	2,5		CR.1.1 TDD	-	CR.1.1 TDD	-
	3,6		CR.2.1 FDD	-	CR.2.1 FDD	-
- "	1,4		CCR.1.1 FDD	-	CCR.1.1 FDD	-
Dedicated CORESET Reference Channel	2,5		CCR.1.1 TDD	-	CCR.1.1 TDD	-
	3,6		CCR.2.1 TDD	-	CCR.2.1 TDD	-
	1,4		SSB.1		SSB.1	
SSB configuration	2,5		SSB.1		SSB.1	
	3,6		SSB.2		SSB.2	
OCNG Patterns	1~6		OP.		OP	
	1,4		TRS.1.1 FDE		TRS.1.1 FD	
TRS configuration	2,5		TRS.1.1 TDE		TRS.1.1 TD	
	3,6		TRS.1.2 TDE	)	TRS.1.2 TD	D

Initial BWP	Configuration	1~6		DLBWF ULBWF		DLBW ULBW	
Dedicated E	BWP configuration	1~6		DLBWF ULBWF	P.1.1	DLBW ULBW	P.1.1
SMTC conf	iguration	1~6		SMTC		SMT	
Time offset and Cell 3	between Cell 2	1~6	μs	3	3		
EPRE ratio of PSS to SSS  EPRE ratio of PBCH DMRS to SSS  EPRE ratio of PBCH to PBCH DMRS  EPRE ratio of PDCCH DMRS to SSS							
DMRS	f PDCCH to PDCCH	1~6	dB	0	0	0	0
SSS	f PDSCH DMRS to						
DMRS	f OCNG DMRS to						
	f OCNG to OCNG						
$N_{oc}$ Note2	NR_FDD_FR1_A, NR_TDD_FR1_A NOTE5;  NR_FDD_FR1_B NR_TDD_FR1_D, NR_TDD_FR1_D, NR_TDD_FR1_E, NR_TDD_FR1_E NR_FDD_FR1_G NR_FDD_FR1_G NR_FDD_FR1_G NR_FDD_FR1_G	1~6	dBm/15 kHz	-94.6	-94.65		-115  -114.5  -114  -113.5  -113  -112  -111.5
$N_{oc}$ Note2	NR_FDD_FR1_A, NR_TDD_FR1_A NR_TDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D, NR_TDD_FR1_D NR_FDD_FR1_E, NR_TDD_FR1_E NR_TDD_FR1_E NR_FDD_FR1_G NR_FDD_FR1_G NR_FDD_FR1_G	1,2,4,5	dBm/SS	-94.6	-94.65		-115 -114.5 -114 -113.5 -113 -112 -111.5
	NR_FDD_FR1_A, NR_TDD_FR1_A NOTE5,  NR_FDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D, NR_TDD_FR1_D NR_FDD_FR1_E, NR_TDD_FR1_E NR_FDD_FR1_G NR_FDD_FR1_G NR_FDD_FR1_H	3,6	B SCS	-91.65		$(N_{oc}  ext{ for } C  ext{ 3 +8dB})$	-112.00 -112.50 -112.00 -111.50 -111.00 -110.00 -110.50
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$		1~6	dB	10	10	13	-3
SS- RSRPNote3  RSRPNote3  NR_FDD_FR1_A, NR_TDD_FR1_B NR_FDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D, NR_TDD_FR1_D		1,2,4,5	dBm/SC S	-84.65		(RSRP for Cell 3 +25dB)	-118.00 -117.50 -117.00 -116.50

	NR_FDD_FR1_E, NR_TDD_FR1_E						-116.00
	NR FDD FR1 G						-115.00
	NR_FDD_FR1_H						-114.50
	NR FDD FR1 A,						-115.00
	NR_TDD_FR1_A						
	NOTE 5,						444.50
	NR_FDD_FR1_B						-114.50
	NR_TDD_FR1_C	2.0		-81.6	(RSRP for	-114.00	
	NR_FDD_FR1_D, NR_TDD_FR1_D	3,6		-01.0	ອວ	Cell 3 +25dB)	-113.50
	NR_FDD_FR1_E,					(2305)	-113.00
	NR_TDD_FR1_E						
	NR_FDD_FR1_G						-112.00
	NR_FDD_FR1_H						-111.50
	NR_FDD_FR1_A,						-85.28
	NR_TDD_FR1_A						
	NR_FDD_FR1_B						-84.78
	NR TDD FR1 C		dBm/			(Io for	-84.28
	NR FDD FR1 D,	1,2,4,5	9.36MH	-56.2	28	Channel 3	-83.78
	NR_TDD_FR1_D	NR TDD FR1 D z		+19.75dB)	03.70		
	NR_FDD_FR1_E,						-83.28
	NR_TDD_FR1_E NR_FDD_FR1_G						-82.28
	NR FDD FR1 H						-82.28
Io <sup>Note3</sup>	NR_FDD_FR1_A,						-79.19
	NR TDD FR1 A						-/9.19
	NOTE 6,						
	NR_FDD_FR1_B						-78.69
	NR_TDD_FR1_C		dBm/			(Io for	-78.19
	NR_FDD_FR1_D,	3,6	38.16M	-50.1	9	Channel 3	-77.69
	NR_TDD_FR1_D NR_FDD_FR1_E,		Hz			+19.75dB)	77.10
	NR_TDD_FR1_E,						-77.19
	NR FDD FR1 G						-76.19
	NR FDD FR1 H						-75.69
$\hat{E}_s/N_{oc}$		1~6	dB	10	10	13	-3
	gation condition	1~6	-	AWG		AW	
	na configuration			1x2		1x	2
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total							
	transmitted power spectral density is achieved for all OFDM symbols.						
Note 2: I	Note 2: Interference from other cells and noise sources not specified in the test is assumed to be						

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power

for  $N_{oc}$  to be fulfilled.

Note 3: RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5 The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification

# A.4.7.1.2.3 Test Requirements

The SS-RSRP measurement accuracy for Cell 2 and Cell 3 shall fulfil the Absolute requirement in clause 10.1.4.1.1 and Relative requirement in clause 10.1.4.1.2.

# A.4.7.1.3 Void

# A.4.7.2 SS-RSRQ

# A.4.7.2.1 EN-DC Intra-frequency measurement accuracy with FR1 serving cell and FR1 target cell

# A.4.7.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in Clause 10.1.7.1.1.

# A.4.7.2.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configuration are shown in Table A.4.7.2.1.2-1. The absolute accuracy of SS-RSRQ intra-frequency measurement is test by using the parameters in Table A.4.7.2.1.2-2. The configuration of cell 1 (E-UTRA PCell) is specified in clause A.3.7.2.1. In all test cases, Cell 2 is the PSCell and Cell 3 is the target cell.

Table A.4.7.2.1.2-1: SS-RSRQ Intra frequency SS-RSRQ supported test configurations

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

Table A.4.7.2.1.2-2: SS-RSRQ Intra frequency test parameters

Doron		llmit	Test 1		Test 2		Test 3	
Paran	neter	Unit	Cell 2	Cell 3	Cell 2	Cell 3	Cell 2	Cell 3
SSB ARFCN			fre	freq1 freq1			fre	q1
Duplex mode	Config 1,4				F	)D		
Duplex mode	Config 2,3,5,6				T	DD		
	Config 1,4		Not Applicable					
TDD configuration	Config 2,5				TDDC	onf.1.1		
	Config 3,6		TDDConf.2.1					
	Config 1,4				10: N <sub>R</sub>	<sub>B,c</sub> = 52		
BW <sub>channel</sub>	Config 2,5	MHz	10: N <sub>RB,c</sub> = 52					
	Config 3,6		40: N <sub>RB,c</sub> = 106					
	Initial DL BWP		DLBWP.0.1					
DMD configuration	Dedicated DL BWP				DLBV	VP.1.1		
BWP configuration	Initial UL BWP				ULBV	VP.0.1		
	Dedicated UL BWP				ULBV	VP.1.1		
DRX Cycle		ms			Not Ap	olicable		
PDSCH Reference	Config 1,4		SR.1.1 FDD		SR.1.1 FDD		SR.1.1 FDD	
measurement	Config 2,5		SR.1.1 TDD	-	SR.1.1 TDD	-	SR.1.1 TDD	-
channel	Config 3,6		SR2.1 TDD		SR2.1 TDD		SR2.1 TDD	

		T	1		1		1		•	
		Config 1,4		CR.1.1 FDD		CR.1.1 FDD		CR.1.1 FDD		
RMSI Referen	CORESET ce Channel	Config 2,5		CR.1.1 TDD	-	CR.1.1 TDD	-	CR.1.1 TDD		
		Config 3,6		CR.2.1 TDD		CR.2.1 TDD		CR.2.1 TDD		
		Config 1,4		CCR.1. 1 FDD		CCR.1. 1 FDD		CCR.1. 1 FDD		
Control RMC	Channel	Config 2,5		CCR.1. 1 TDD	-	CCR.1. 1 TDD	-	CCR.1. 1 TDD	-	
00110		Config 3,6		CCR.2. 1 TDD		CCR.2.		CCR.2. 1 TDD		
	OCNG Patterns						P. 1			
	SI-Measureme	ent					plicable			
STMC c	onfigruation	T					TC.1			
SSB cor	nfiguration	Config 1,2,4,5					1 FR1			
		Config 3,6				SSB.	2 FR1			
	/PDCCH	Config 1,2,4,5	kHz				kHz			
subcarri	er spacing	Config 3,6	KI IZ			301	кHz			
	tio of PSS to S									
	tio of PBCH DN									
	tio of PBCH to									
EPRE rat	tio of PDCCH [	OMRS to SSS								
		o PDCCH DMRS	dB	dB 0 0		0	0	0	0	
	tio of PDSCH D									
	tio of PDSCH to									
	PRE ratio of OCNG DMRS to SSS(Note 1)									
EPRE rat	tio of OCNG to	OCNG DMRS (Note 1)								
		NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 7	- -					-114		
		NR FDD FR1 B						-11	3.5	
		NR TDD FR1 C						-1		
	Config	NR_FDD_FR1_D,	1		85	4	Λ1		10	
	1,2,4,5	NR_TDD_FR1_D		-	65	-101		-112.5		
		NR_FDD_FR1_E,						-112		
		NR_TDD_FR1_E	-						-111	
N.T		NR_FDD_FR1_G								
$N_{oc}$		NR_FDD_FR1_H	dBm/15k					-11	0.5	
Note2		NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 7	Hz					-1	14	
		NR_FDD_FR1_B							3.5	
		NR TDD FR1 C							13	
	Config 3,6	NR_FDD_FR1_D, NR_TDD_FR1_D		-	91		-	-11	2.5	
		NR_FDD_FR1_E, NR_TDD_FR1_E						-1	12	
		NR FDD FR1 G	-					-1	11	
		NR_FDD_FR1_H						0.5		
		NR FDD FR1_H						-11	0.0	
		NR_TDD_FR1_A, NR_TDD_FR1_A NOTE 7						-1	14	
$N_{oc}$ Config - 1,2,4,5		NR_FDD_FR1_B	dBm/SC						3.5	
		NR_TDD_FR1_C	S	-	85	-1	01	-1	13	
Note2	,,_,,,,	NR_FDD_FR1_D, NR_TDD_FR1_D						-11	2.5	
		NR_FDD_FR1_E, NR_TDD_FR1_E						-1	12	

	1	ND EDD ED4 C	<u> </u>					4	11
		NR_FDD_FR1_G NR_FDD_FR1_H						-1 <sup>1</sup>	
		NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 7						-1	11
		NR_FDD_FR1_B						-11	
	Config	NR_TDD_FR1_C NR_FDD_FR1_D,		-8	38		_	-110 -109.5	
	3,6	NR_TDD_FR1_D						-10	9.5
		NR_FDD_FR1_E, NR_TDD_FR1_E NR_FDD_FR1_G						-10 -10	
		NR_FDD_FR1_H						-10	
$\hat{E}_{s}/I_{ot}$			dB	-1	.76	-4.7		-5.46	-5.46
$\hat{E}_s/N_c$	) <i>C</i>	_	dB	3	3	-2.9	-2.9	-4	-4
		NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 7						-118	-118
		NR_FDD_FR1_B					-103.9	-117.5	-117.5
	Config	NR_TDD_FR1_C NR_FDD_FR1_D,		-82	-82	-103.9		-117	-117
	1,2,4,5	NR_TDD_FR1_D						-116.5	-116.5
		NR_FDD_FR1_E, NR TDD FR1 E						-116	-116
SS-		NR_FDD_FR1_G						-115	-115
RSRP Note3		NR_FDD_FR1_H NR_FDD_FR1_A,	dBm/SC S					-114.5	-114.5
Notes		NR_TDD_FR1_A						-115	-115
		NR_FDD_FR1_B						-114.5	-114.5
	Config	NR_TDD_FR1_C NR_FDD_FR1_D,		-85	-85	-	-	-114	-114
	3,6	NR_TDD_FR1_D						-113.5	-113.5
		NR_FDD_FR1_E, NR_TDD_FR1_E						-113	-113
		NR_FDD_FR1_G						-112	-112
		NR_FDD_FR1_H NR_FDD_FR1_A,						-111.5	-111.5
		NR_TDD_FR1_A							
		NR_FDD_FR1_B							
SS-RSR	Q Note3	NR_TDD_FR1_C NR_FDD_FR1_D,	dB	-14.77	-14.77	-16.76	-16.76	-17.34	-17.34
		NR_TDD_FR1_D							
		NR_FDD_FR1_E, NR TDD FR1 E							
		NR_FDD_FR1_G NR_FDD_FR1_H							
		NR_FDD_FR1_H NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 7						-83	3.5
lo <sup>Note3</sup>	Config	NR FDD FR1 B	dBm/	_!	50	-7	<b>'</b> 0	-8	3
	1,2,4,5	NR_TDD_FR1_C	9.36MHz		-				2.5
		NR_FDD_FR1_D, NR_TDD_FR1_D						-8	2

	NR_FDD_FR1_E, NR TDD FR1 E						-81	1.5
	NR_FDD_FR1_G						-80	).5
	NR_FDD_FR1_H						-8	0
	NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 7						-77	7.4
	NR_FDD_FR1_B						-76	3.9
Config	NR_TDD_FR1_C	dBm/	-50		-		-76.4	
Config 3,6	NR_FDD_FR1_D, NR_TDD_FR1_D	38.16M Hz					-75.9	
	NR_FDD_FR1_E, NR_TDD_FR1_E							5.4
	NR_FDD_FR1_G						-74	1.4
	NR_FDD_FR1_H						-73	3.9
Propagation condi	Propagation condition -		AWGN	AWGN	AWGN	AWGN	AWGN	AWGN
Antenna configuration			1x2	1x2	1x2	1x2	1x2	1x2

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.
- Note 3: SS-RSRQ, SS-RSRP, and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 5: NR operating band groups are as defined in Clause 3.5.2.
- Note 6: Subtest 2 is not used when testing with 30kHz SSB SCS.
- Note 7: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

# A.4.7.2.1.3 Test Requirements

The SS-RSRQ measurement accuracy shall fulfil the requirements in clause 10.1.7.1.1.

# A.4.7.3 SS-SINR

# A.4.7.3.1 EN-DC Intra-frequency measurement accuracy with FR1 serving cell and FR1 target cell

# A.4.7.3.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.12.1.1.

# A.4.7.3.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configuration are shown in Table A.4.7.3.1.2-1. The absolute accuracy of SS-SINR intra-frequency measurement is tested by using the parameters in Table A.4.7.3.1.2-2. The configuration of cell 1 (E-UTRA PCell) is specified in clause A.3.7.2.1. In all test cases, Cell 2 is the PSCell and Cell 3 is the target cell.

Table A.4.7.3.1.2-1: SS-SINR Intra frequency SS-SINR supported test configurations

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

Table A.4.7.3.1.2-2: SS-SINR Intra frequency test parameters

Parameter		Unit	Tes		Test 2	
Parame	eter	Unit	Cell 2	Cell 3	Cell 2	Cell 3
SSB ARFCN			fre	freq1 freq1		
Duplex mode	Config 1,4			F	DD	
Duplex mode	Config 2,3,5,6		TDD Not Applicable			
	Config 1,4					
TDD configuration	Config 2,5		TDDConf.1.1			
	Config 3,6			TDDC	onf.2.1	
Downlink initial BWP cor	nfiguration			DLBV	VP.0.1	
Downlink dedicated BWI	P configuration			DLBV	VP.1.1	
Uplink initial BWP config				ULBV	VP.0.1	
Uplink dedicated BWP c	onfiguration			ULBV	VP.1.1	
DRX Cycle configuration	1	ms		Not Ap	plicable	
-	Config 1, 4			TRS.1	.1 FDD	
TRS configuration	Config 2, 5				.1 TDD	
	Config 3, 6				.2 TDD	
	Config 1,4		SR.1.1		SR.1.1	
	Corning 1,4		FDD		FDD	
PDSCH Reference	Config 2,5		SR.1.1	_	SR.1.1	_
measurement channel			TDD		TDD	
	Config 3,6		SR.2.1 TDD		SR2.1 TDD	
	Config 1,4		CR.1.1		CR.1.1	
RMSI CORESET	Coning 1,4		FDD	-	FDD	
Reference Channel	Config 2,5		CR.1.1 TDD		CR.1.1 TDD	
	Config 3,6		CR.2.1 TDD		CR.2.1 TDD	
			CCR.1.		CCR.1.1	
	Config 1,4		1 FDD		FDD	
Dedicated CORESET	Config 2,5		CCR.1.	_	CCR.1.1	_
Reference Channel			1 TDD		TDD	
	Config 3,6		CCR.2. 1 TDD		CCR.2.1 TDD	
OCNG Patterns	1			0	P.1	
SS-RSSI-Measurement					plicable	
SMTC configruation					TC.1	
_	Config 1,2,4,5				1 FR1	
SSB configuration	Config 3,6				2 FR1	
PDSCH/PDCCH	Config 1,2,4,5	1-1-1-		,	15	
subcarrier spacing	Config 3,6	kHz		3	30	
EPRE ratio of PSS to SSS						
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS		_				
EPRE ratio of PDCCH DMRS to SSS		dB	0	0	0	0
	EPRE ratio of PDCCH to PDCCH DMRS EPRE ratio of PDSCH DMRS to SSS					
EPRE ratio of PDSCH DIVIN		-				
EPRE ratio of OCNG DMRS		-				
EPRE ratio of OCNG DIMRS to \$55(Note 1)		1	1		l .	

EPRE ratio	of OCNG to OC	CNG DMRS (Note 1)					
		NR_FDD_FR1_A,				-11	16
		NR_TDD_FR1_A					
		NR_FDD_FR1_B				-115.5	
		NR TDD FR1 C				-115.5 -115	
$N_{oc}^{ m Note2}$		NR FDD FR1 D,	dBm/15kH	-6	93	-114	
		NR_TDD_FR1_D	Z				
		NR_FDD_FR1_E,				-11	14
		NR_TDD_FR1_E NR_FDD_FR1_G				-11	13
		NR FDD FR1 H				-112	
	Config 1,2,4			_0	93	Same as	
	001111g 1,2,1					15k	Hz
		NR_FDD_FR1_A, NR_TDD_FR1_A				-11	13
		NOTE 6				-11	13
		NR_FDD_FR1_B				-112	2.5
$N_{oc}^{ m Note2}$		NR_TDD_FR1_C	dBm/SCS			-11	12
	Config 3,6	NR_FDD_FR1_D,		-6	90	-11°	1.5
		NR_TDD_FR1_D NR_FDD_FR1_E,		l			
		NR_TDD_FR1_E				-111	
		NR_FDD_FR1_G				-110	
2 /		NR_FDD_FR1_H				-109	9.5
	$\hat{E}_{s}/I_{ot}$		dB	0	-3.19	-5.46	-5.46
$\hat{E}_s/N_{oc}$			dB	4.54	2.66	-4	-4
		NR_FDD_FR1_A,		-88.46			
	Ozufu	NR_TDD_FR1_A				-120	-120
		NR_FDD_FR1_B				-119.5	-119.5
		NR TDD FR1 C			-90.34	-119	-119
	Config 1,2,4,5	NR_FDD_FR1_D,				-118.5	-118.5
	1,2,7,0	NR_TDD_FR1_D				-110.5	-110.5
		NR_FDD_FR1_E, NR_TDD_FR1_E				-118	-118
		NR FDD FR1 G				-117	-117
SS- RSRP <sup>Not</sup>		NR FDD FR1 H	-ID (0.00			-116.5	-116.5
e3		NR_FDD_FR1_A,	dBm/SCS				
		NR_TDD_FR1_A				-117	-117
		NR FDD FR1 B				-116.5	-116.5
		NR TDD FR1 C				-116	-116.3
	Config 3,6	NR_FDD_FR1_D,		-85.46	-87.34	-115.5	-115.5
		NR_TDD_FR1_D					
		NR_FDD_FR1_E, NR TDD FR1 E				-115	-115
		NR FDD FR1 G				-114	-114
		NR_FDD_FR1_H				-113.5	-113.5
NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6  NR_FDD_FR1_B							
		NR_TDD_FR1_A					
	ata 2	NR TDD FR1 C					
SS-SINR N	oies	NR_FDD_FR1_D,	dB	0	-3.19	-5.46	-5.46
		NR_TDD_FR1_D					
		NR_FDD_FR1_E,					
		NR_TDD_FR1_E NR_FDD_FR1_G					
L		LNV_LNN_LKI_G	L	<u> </u>			

		NR_FDD_FR1_H					
		NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6				-85.	51
		NR_FDD_FR1_B		l		-85.	01
	Config	NR_TDD_FR1_C	dBm/			-84.	51
	Config 1,2,4,5	NR_FDD_FR1_D, NR_TDD_FR1_D	9.36MHz	-5	7.5	-84.	01
		NR_FDD_FR1_E, NR_TDD_FR1_E				-83.	51
		NR_FDD_FR1_G			-82.	51	
lo <sup>Note3</sup>		NR_FDD_FR1_H				-82.	01
		NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6				-79.	41
		NR_FDD_FR1_B		-51.41		-78.	91
		NR_TDD_FR1_C	dPm/			-78.	41
	Config 3,6	NR_FDD_FR1_D, NR_TDD_FR1_D	dBm/ 38.16MHz		.41	-77.	91
		NR_FDD_FR1_E, NR_TDD_FR1_E				-77.	41
		NR_FDD_FR1_G				-76.	41
		NR_FDD_FR1_H				-75.	91
Propagatio	Propagation condition		-		AV	VGN	
	nfiguration		-			x2	

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.
- Note 3: SS-SINR, SS-RSRP, and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 5: NR operating band groups are as defined in Clause 3.5.2.
- Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

# A.4.7.3.1.3 Test Requirements

The SS-SINR measurement accuracy shall fulfil the requirements in clause 10.1.12.1.1.

# A.4.7.3.2 EN-DC Inter-frequency measurement accuracy with FR1 serving cell and FR1 target cell

## A.4.7.3.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.14.1.1 and 10.1.14.1.2 for interfrequency measurement.

#### A.4.7.3.2.2 Test Parameters

In this test case the two NR cells (i.e., Cell 2 and Cell 3) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table A.4.7.3.2.2-1. Both absolute accuracy and relative accuracy requirements of SS-SINR inter-frequency measurement are tested by using test parameters in Table A.4.7.3.2.2-2. In all test cases, Cell 2 is the PSCell and Cell 3 is target cell. Cell 1 is the E-UTRA cell of which specific test parameters for this test case are specified in Table A.3.7.2.1-1.

Table A.4.7.3.2.2-1: SS-SINR Inter frequency SS-SINR supported test configurations

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

Table A.4.7.3.2.2-1: SS-SINR Inter frequency test parameters

Parameter		I Imit		st 1		st 2	Test 3	
	eter	Unit	Cell 2	Cell 3	Cell 2	Cell 3	Cell 2	Cell 3
SSB ARFCN	0 5 4 4		freq1	freq2	freq1	freq2	freq1	freq2
Duplex mode	Config 1,4 Config 2,3,5,6					DD DD		
	Config 1,4				Not Ap	plicable		
TDD configuration	Config 2,5				TDDC	onf.1.1		
	Config 3,6				TDDC	onf.2.1		
Downlink initial BWP cor	nfiguration				DLBV	VP.0.1		
Downlink dedicated BWI	P configuration				DLB\	VP.1.1		
Uplink initial BWP config	uration				ULB\	VP.0.1		
Uplink dedicated BWP c	onfiguration				ULBV	VP.1.1		
DRX Cycle configuration	l	ms				plicable		
	Config 1, 4					.1 FDD		
TRS configuration	Config 2, 5		TRS.1.1 TDD					
	Config 3, 6		TRS.1.2 TDD					
	Config 1,4		SR.1.1 FDD		SR.1.1 FDD		SR.1.1 FDD	
PDSCH Reference measurement channel	Config 2,5		SR.1.1 TDD	-	SR.1.1 TDD	-	SR.1.1 TDD	-
	Config 3,6		SR.2.1 TDD		SR.2.1 TDD		SR.2.1 TDD	
	Config 1,4		CR.1.1 FDD		CR.1.1 FDD		CR.1.1 FDD	
RMSI CORESET Reference Channel	Config 2,5		CR.1.1 TDD	-	CR.1.1 TDD	-	CR.1.1 TDD	-
	Config 3,6		CR.2.1 TDD		CR.2.1 TDD		CR.2.1 TDD	
	Config 1,4		CCR.1. 1 FDD		CCR.1. 1 FDD		CCR.1. 1 FDD	
Dedicated CORESET Reference Channel	Config 2,5		CCR.1. 1 TDD	-	CCR.1. 1 TDD	-	CCR.1. 1 TDD	-
	Config 3,6		CCR.2. 1 TDD		CCR.2. 1 TDD		CCR.2. 1 TDD	

OCNG Pat	terns					0	P.1			
SS-RSSI-N	/leasurement			Not Applicable						
SMTC con	figruation			SMTC.1						
		Config 1,2,4,5		SSB.1 FR1						
SSB config	juration	Config 3,6				SSB.	2 FR1			
PDSCH/PE	OCCH	Config 1,2,4,5	kHz			•	15			
subcarrier	spacing	Config 3,6	KHZ			(	30			
	of PSS to SSS	1 000								
	of PBCH DMRS of PBCH to PB(									
EPRE ratio	of PDCCH DMF	RS to SSS								
	of PDCCH to PI of PDSCH DMF		dB	0	0	0	0	0	0	
EPRE ratio	of PDSCH to PI	DSCH								
		S to SSS(Note 1)								
EPRE fallo	BI OCNG 10 OC	NG DMRS (Note 1)  NR FDD FR1 A								
		NR_TDD_FR1_A						-1	19.5	
		NR_FDD_FR1_B							19	
$N_{oc}^{ m Note2}$	Config	NR_TDD_FR1_C NR_FDD_FR1_D	dBm/15k	-8	38	-10	8.5		-118.5	
1 · oc	1,2,4,5	NR_TDD_FR1_D	Hz				0.0	-118		
		NR_FDD_FR1_E						-117.5		
		NR_TDD_FR1_E NR_FDD_FR1_G						-116.5		
		NR_FDD_FR1_H							16	
	Config 1,2,4,5			-88		-108.5			s Noc for kHz	
		NR_FDD_FR1_A NR_TDD_FR1_A		-85		-105.5		-116.5		
		NR FDD FR1 B						-1	16	
$N_{oc}^{ m Note2}$		NR_TDD_FR1_C	dBm/SC					-115.5		
	Config 3,6	NR_FDD_FR1_D NR_TDD_FR1_D	S					-1	15	
		NR_FDD_FR1_E NR_TDD_FR1_E						-1	14.5	
		NR_FDD_FR1_G							14.5	
^ /-		NR_FDD_FR1_H							13	
$\hat{E}_s/I_{ot}$			dB		.75	-	0	-4.0		
$\hat{E}_s/N_{oc}$		l ND === : :	dB	-1.	.75	2	0	-4	1.0	
		NR_FDD_FR1_A NR_TDD_FR1_A NOTE 6						-12	23.5	
		NR_FDD_FR1_B							23	
	Config	NR_TDD_FR1_C		90	75		) E	-12	22.5	
SS-	1,2,4,5	NR_FDD_FR1_D NR_TDD_FR1_D	dBm/SC	-88	.75	-86	3.5	-1	22	
RSRP <sup>Not</sup> e3		NR_FDD_FR1_E NR_TDD_FR1_E	dBm/SC S						21.5	
		NR_FDD_FR1_G NR_FDD_FR1_H							20.5 20	
		NR FDD FR1 A						† -'	<b>4</b> 0	
	Config 3,6	NR_TDD_FR1_A		-86.75		-85	5.5		20.5	
NR_FDD_FR		NR_FDD_FR1_B							20	

		NR TDD FR1 C				-119.5
		NR FDD FR1 D	1			-119.5
		NR_FDD_FR1_D				-119
		NR FDD FR1 E				
		NR TDD FR1 E				-118.5
		NR FDD FR1 G	-			-117.5
		NR FDD FR1 H	1			-117
		NR FDD FR1 A				117
		NR TDD FR1 A				
		NOTE 6				
		NR_FDD_FR1_B				
		NR_TDD_FR1_C				
SS-SI	INR Note3	NR_FDD_FR1_D	dB	-1.75	20	-4.0
		NR_TDD_FR1_D				
		NR_FDD_FR1_E				
		NR_TDD_FR1_E				
		NR_FDD_FR1_G	1			
	1	NR_FDD_FR1_H				
		NR_FDD_FR1_A		-57.83		
		NR_TDD_FR1_A				-90.09
					-60.5	00.50
		NR_FDD_FR1_B	dBm/			-89.59
	Config	NR_TDD_FR1_C				-89.09
	1,2,4,5	NR_FDD_FR1_D	9.36MHz			-88.59
		NR_TDD_FR1_D NR_FDD_FR1_E	1			
		NR TDD_FR1_E				-88.09
		NR FDD FR1 G	-			-87.09
I Note?		NR FDD FR1 H	-			-86.59
Io <sup>Note3</sup>		NR FDD FR1 A				00.00
		NR TDD FR1 A				-84
		NOTE 6				
		NR_FDD_FR1_B				-83.5
		NR_TDD_FR1_C	dBm/			-83
	Config 3,6	NR_FDD_FR1_D	38.16MH	-51.73	-54.41	-82.5
		NR_TDD_FR1_D	z			-02.3
		NR_FDD_FR1_E				-82
		NR_TDD_FR1_E	1			
		NR_FDD_FR1_G				-81
<u> </u>		NR_FDD_FR1_H			1111011	-80.5
	on condition		-		AWGN	
Antenna co	onfiguration		<u> </u>		1x2	

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

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

Note 3: SS-SINR, SS-RSRP, and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: NR operating band groups are as defined in Clause 3.5.2.

Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

# A.4.7.3.2.3 Test Requirements

The SS-SINR measurement accuracy shall fulfil the requirements in clause 10.1.14.1.1 and 10.1.14.1.2.

# A.4.7.4 L1-RSRP measurement for beam reporting

# A.4.7.4.1 SSB based L1-RSRP measurement

# A.4.7.4.1.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 9.5.2 and clause 10.1.19.1 for L1-RSRP measurements based on SSB with the testing configurations for NR cells in Table A.4.7.4.1.1-1.

Table A.4.7.4.1.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test

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

# A.4.7.4.1.2 Test parameters

In this set of test cases there are two cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.4.7.4.1.2-1 below. The absolute and relative accuracy of L1-RSRP measurements are tested by using the parameters in Table A.4.7.4.1.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured one SSB resource set with two SSB resources. UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSB resources 0 and 1.

Table A.4.7.4.1.2-1: FR1 SSB based L1-RSRP test parameters

Parameter	Config	Unit	Test 1	Test 2
SSB GSCN	1~6		freq1	freq1
	1,4		FDD	FDD
Duplex mode	2,5		TDD	TDD
	3,6		TDD	TDD
	1,4		N/A	N/A
TDD Configuration	2,5		TDDConf.1.1	TDDConf.1.1
	3,6		TDDConf.2.1	TDDConf.2.1
	1,4		10: N <sub>RB,c</sub> = 52	10: N <sub>RB,c</sub> = 52
BWchannel	2,5	MHz	10: N <sub>RB,c</sub> = 52	10: N <sub>RB,c</sub> = 52
	3,6		40: N <sub>RB,c</sub> = 106	40: N <sub>RB,c</sub> = 106
PDSCH Reference	1,4		SR.1.1 FDD	SR.1.1 FDD
measurement channel	2,5		SR.1.1 TDD	SR.1.1 TDD
measurement channel	3,6		SR.2.1 TDD	SR.2.1 TDD
RMSI CORESET Reference	1,4		CR.1.1 FDD	CR.1.1 FDD
Channel	2,5		CR.1.1 TDD	CR.1.1 TDD
Chamie	3,6		CR.2.1 TDD	CR.2.1 TDD
Dedicated CORESET	1,4		CCR.1.1 FDD	CCR.1.1 FDD
Reference Channel	2,5		CCR.1.1 TDD	CCR.1.1 TDD
Neierence Chaillei	3,6		CCR.2.1 TDD	CCR.2.1 TDD
SSB configuration	1,4		SSB.3 FR1	SSB.3 FR1

		2,5	<u> </u>	SSB.3 FR1	CCD 2 ED4
		3,6	-	SSB.4 FR1	SSB.3 FR1 SSB.4 FR1
OCNG P	lattarna	1~6			
OCNG P	allerns	_		OP.1	OP.1
TDC con	figuration	1,4		TRS.1.1 FDD TRS.1.1 TDD	TRS.1.1 FDD TRS.1.1 TDD
I KO CON	iliguration	2,5			
		3,6		TRS.1.2 TDD DLBWP.0.1	TRS.1.2 TDD DLBWP.0.1
Initial BV	VP Configuration	1~6			
				ULBWP.0.1	ULBWP.0.1 DLBWP.1.1
Dedicate	ed BWP configuration	1~6		DLBWP.1.1 ULBWP.1.1	ULBWP.1.1
SMTC co	onfiguration	1~6		SMTC.1	SMTC.1
	nfigType	1~6		periodic	periodic
reportQu		1~6		ssb-Index-RSRP	ssb-Index-RSRP
	of reported RS	1~6		2	2
	P reporting period	1~6		slot80	slot80
	o of PSS to SSS	1 0		310100	310100
	o of PBCH DMRS to SSS				
	o of PBCH to PBCH DMRS				
	o of PDCCH DMRS to SSS				
EPRE ratio	o of PDCCH to PDCCH				
	o of PDSCH DMRS to SSS	1~6	dB	0	0
	o of PDSCH to PDSCH			-	
DMRS					
SSS <sup>Note 1</sup>	o of OCNG DMRS to				
	o of OCNG to OCNG				
DMRS Note					
	NR_FDD_FR1_A,				
	NR_TDD_FR1_A				-117
	NOTE 5				
	NR_FDD_FR1_B				-116.5
$N_{oc}$	NR_TDD_FR1_C				-116
Note2	NR_FDD_FR1_D,	1~6	dBm/15kHz	-94.65	-115.5
	NR_TDD_FR1_D				110.0
	NR_FDD_FR1_E,				-115
	NR_TDD_FR1_E				-
	NR_FDD_FR1_G				-114
	NR_FDD_FR1_H				-113.5
	NR_FDD_FR1_A,				147
1	NR_TDD_FR1_A NOTE 5				-117
	NR FDD FR1 B				-116.5
	NR TDD FR1 C				-116.5
	NR FDD FR1 D,	1,2,4,5		-94.65	-110
	NR TDD FR1 D	1,4,4,5		-94.00	-115.5
	NR FDD FR1 E,				
$N_{oc}$	NR TDD FR1 E		dBm/SSB		-115
Note2	NR FDD FR1 G		SCS		-114
INUIGZ	NR FDD FR1 H				-113.5
	NR FDD FR1 A,		1		
	NR TDD FR1 A				-114
	NOTE 5				
	NR_FDD_FR1_B	3,6		-91.65	-113.5
	NR_TDD_FR1_C	, ·			-114
	NR_FDD_FR1_D,				
	NR_TDD_FR1_D				-112.5

	T	ı	1	I	
	NR_FDD_FR1_E, NR_TDD_FR1_E				-112
	NR FDD FR1 G				-111
	NR FDD FR1 H				-110.5
r /r	THIC DO THE T	4.0	ID.	40	
$\hat{E}_{s}/I_{ot}$	T	1~6	dB	10	-3
	NR_FDD_FR1_A,				400
	NR_TDD_FR1_A				-120
	NR FDD FR1 B				-119.5
	NR TDD FR1 C				-119
	NR FDD FR1 D,	1,2,4,5		-84.65	440.5
	NR_TDD_FR1_D				-118.5
	NR_FDD_FR1_E,				-118
	NR_TDD_FR1_E				
SSB	NR_FDD_FR1_G		ID (00D		-117
RSRP	NR_FDD_FR1_H NR_FDD_FR1_A,		dBm/SSB SCS		-116.5
Note3	NR TDD FR1 A		303		-117
	NOTE 5				-117
	NR FDD FR1 B				-116.5
	NR_TDD_FR1_C				-116
	NR_FDD_FR1_D,	3,6		-81.65	-115.5
	NR_TDD_FR1_D				-110.0
	NR_FDD_FR1_E,				-115
	NR_TDD_FR1_E				-114
	NR_FDD_FR1_G NR_FDD_FR1_H				-114
	NR FDD FR1 A,				-110.0
	NR TDD FR1 A				-87.28
	NOTE 5				
	NR_FDD_FR1_B				-86.78
	NR_TDD_FR1_C		dBm/9.36		-86.28
	NR_FDD_FR1_D,	1,2,4,5	MHz	-56.28	-85.78
	NR_TDD_FR1_D				
	NR_FDD_FR1_E, NR TDD FR1 E				-85.28
	NR FDD FR1 G				-84.28
. Note?	NR FDD FR1 H				-83.78
lo <sup>Note3</sup>	NR_FDD_FR1_A,				
	NR_TDD_FR1_A				-81.19
	NOTE 5				
	NR_FDD_FR1_B				-80.69
	NR_TDD_FR1_C NR_FDD_FR1_D,	3,6	dBm/38.16	-50.19	-80.19
	NR_TDD_FR1_D,	3,0	MHz	-50.19	-79.69
	NR FDD FR1 E,				
	NR_TDD_FR1_E				-79.19
	NR_FDD_FR1_G				-78.19
	NR_FDD_FR1_H				-77.69
$\hat{E}_s/N_o$	c	1~6	dB	10	-3
Propagat	tion condition	1~6		AWGN	AWGN
Antenna	configuration	1~6		1x2	1x2
		1	1	l	

Note 1:	OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power
	for $N_{oc}$ to be fulfilled.
Note 3:	RSRP and lo levels have been derived from other parameters for information purposes.  They are not settable parameters themselves.
Note 4:	RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5:	The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

# A.4.7.4.1.3 Test Requirements

The L1-RSRP measurement accuracy for SSB#0 and SSB#1 of Cell 2 shall fulfil the requirements in clauses 10.1.19.1.

# A.4.7.4.2 CSI-RS based L1-RSRP measurement on resource set with repetition off

# A.4.7.4.2.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 9.5.3 and clause 10.1.19.2 for L1-RSRP measurements based on CSI-RS with the testing configurations for NR cells in Table A.4.7.4.2.1-1.

Table A.4.7.4.2.1-1: Applicable NR configurations for FR1 CSI-RS based L1-RSRP test

Config	Description
1	LTE FDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode
2	LTE FDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode
3	LTE FDD, NR 30kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode
4	LTE TDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode
5	LTE TDD, NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode
6	LTE TDD, NR 30kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only r	equired to be tested in one of the supported test configurations in each supported band

# A.4.7.4.2.2 Test parameters

In this set of test cases there are two cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.4.7.4.2.2-1 below. The absolute and relative accuracy of L1-RSRP measurements are tested by using the parameters in Table A.4.7.4.2.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured one CSI-RS resource set with two CSI-RS resources. UE is configured to perform RLM and BFD based on SSB 0 and 1. CSI-RS is not transmitted in the same OFDM symbols as SSB.

Table A.4.7.4.2.2-1: FR1 CSI-RS based L1-RSRP test parameters

Parameter	Config	Unit	Test 1	Test 2
SSB GSCN	1~6		freq1	freq1
	1,4		FDD	FDD
Duplex mode	2,5		TDD	TDD
	3,6		TDD	TDD
TDD Configuration	1,4		N/A	N/A
TDD Configuration	2,5		TDDConf.1.1	TDDConf.1.1

		3,6		TDDConf.2.1	TDDConf.2.1
		1,4		10: N <sub>RB,c</sub> = 52	10: N <sub>RB,c</sub> = 52
BW <sub>channe</sub>	BWchannel		MHz	10: N <sub>RB,c</sub> = 52	10: N <sub>RB,c</sub> = 52
		2,5 3,6		40: N <sub>RB,c</sub> = 106	40: N <sub>RB,c</sub> = 106
		1,4		SR.1.1 FDD	SR.1.1 FDD
_	Reference	2,5		SR.1.1 TDD	SR.1.1 TDD
measure	ement channel	3,6		SR.2.1 TDD	SR.2.1 TDD
DMOL O	2DE0ET D (	1,4		CR.1.1 FDD	CR.1.1 FDD
	ORESET Reference	2,5		CR.1.1 TDD	CR.1.1 TDD
Channel		3,6		CR.2.1 TDD	CR.2.1 TDD
Dadiaata	A CODECET	1,4		CCR.1.1 FDD	CCR.1.1 FDD
	ed CORESET ce Channel	2,5		CCR.1.1 TDD	CCR.1.1 TDD
Reference	ce Channel	3,6		CCR.2.1 TDD	CCR.2.1 TDD
		1,4		SSB.1 FR1	SSB.1 FR1
SSB con	figuration	2,5		SSB.1 FR1	SSB.1 FR1
		3,6		SSB.2 FR1	SSB.2 FR1
OCNG P	atterns	1~6		OP.1	OP.1
		1,4		TRS.1.1 FDD	TRS.1.1 FDD
TRS con	figuration	2,5		TRS.1.1 TDD	TRS.1.1 TDD
		3,6		TRS.1.2 TDD	TRS.1.2 TDD
Initial RV	VP Configuration	1~6		DLBWP.0.1	DLBWP.0.1
IIIIIai DV	vi Comiguration	11.30		ULBWP.0.1	ULBWP.0.1
Dedicate	ed BWP configuration	1~6		DLBWP.1.1	DLBWP.1.1
	•	1~6		ULBWP.1.1	ULBWP.1.1
SMTC co	SMTC configuration			SMTC.1	SMTC.1
CSI-RS		1,4		CSI-RS 1.2 FDD	CSI-RS 1.2 FDD
		2,5		CSI-RS 1.2 TDD	CSI-RS 1.2 TDD
		3,6		CSI-RS 2.2 TDD	CSI-RS 2.2 FDD
reportConfigType reportQuantity		1~6		periodic	periodic
	•	1~6 1~6		cri-RSRP	cri-RSRP
	Number of reported RS L1-RSRP reporting period			2	2
	o of PSS to SSS	1~6		slot80	slot80
	o of PBCH DMRS to SSS				
	o of PBCH to PBCH DMRS				
	o of PDCCH DMRS to SSS				
EPRE ration	o of PDCCH to PDCCH				
	o of PDSCH DMRS to SSS	1~6	dB	0	0
	o of PDSCH to PDSCH				
DMRS					
SSS <sup>Note 1</sup>	o of OCNG DMRS to				
	o of OCNG to OCNG				
	DMRS Note 1				
	NR_FDD_FR1_A,				
	NR_TDD_FR1_A				-117
	NOTE 5				
3.7	NR_FDD_FR1_B				-116.5
$N_{oc}$	NR_TDD_FR1_C		,.=		-116
Note2	NR_FDD_FR1_D,	1~6	dBm/15kHz	-94.65	-115.5
	NR_TDD_FR1_D				
	NR_FDD_FR1_E,				-115
	NR_TDD_FR1_E				111
	NR_FDD_FR1_G				-114
Ì	NR_FDD_FR1_H			I	-113.5

	NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5				-117
	NR_FDD_FR1_B				-116.5
	NR_TDD_FR1_C				-116
	NR_FDD_FR1_D,	1,2,4,5		-94.65	-115.5
	NR_TDD_FR1_D NR_FDD_FR1_E,				
	NR_TDD_FR1_E				-115
	NR_FDD_FR1_G				-114
$N_{oc}$	NR_FDD_FR1_H		dBm/CSI-RS		-113.5
Note2	NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5		SCS		-114
	NR_FDD_FR1_B				-113.5
	NR_TDD_FR1_C				-114
	NR_FDD_FR1_D,	3,6		-91.65	-112.5
	NR_TDD_FR1_D NR_FDD_FR1_E,				
	NR_TDD_FR1_E				-112
	NR_FDD_FR1_G				-111
^ /	NR_FDD_FR1_H				-110.5
$\hat{\mathrm{E}}_{_{\mathrm{s}}}/\mathrm{I}_{_{\mathrm{ot}}}$		1~6	dB	10	10
	NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5	1,2,4,5		04.05	-120
	NR_FDD_FR1_B				-119.5
	NR_TDD_FR1_C				-119
	NR_FDD_FR1_D, NR_TDD_FR1_D			-84.65	-118.5
	NR_FDD_FR1_E, NR_TDD_FR1_E		dBm/CSI-RS SCS		-118
CSI-RS	NR_FDD_FR1_G				-117
RSRP	NR_FDD_FR1_H				-116.5
Note3	NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5				-117
	NR_FDD_FR1_B				-116.5
	NR_TDD_FR1_C			04.05	-116
	NR_FDD_FR1_D, NR_TDD_FR1_D	3,6		-81.65	-115.5
	NR_FDD_FR1_E, NR TDD FR1 E				-115
	NR_FDD_FR1_G				-114
	NR_FDD_FR1_H				-113.5
	NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5				-87.28
	NR_FDD_FR1_B				-86.78
	NR_TDD_FR1_C		dBm/9.36		-86.28
lo <sup>Note3</sup>	NR_FDD_FR1_D, NR_TDD_FR1_D	1,2,4,5	MHz	-56.28	-85.78
	NR_FDD_FR1_E, NR_TDD_FR1_E				-85.28
	NR_FDD_FR1_G	-			-84.28
	NR_FDD_FR1_H				-83.78

	NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5				-81.19
	NR_FDD_FR1_B				-80.69
	NR_TDD_FR1_C	]	dBm/38.16		-80.19
	NR_FDD_FR1_D, NR_TDD_FR1_D	3,6	MHz	-50.19	-79.69
	NR_FDD_FR1_E, NR_TDD_FR1_E				-79.19
	NR_FDD_FR1_G	]			-78.19
	NR_FDD_FR1_H				-77.69
$\hat{E}_s/N_{oc}$		1~6	dB	10	-3
Propagation condition		1~6		AWGN	AWGN
Antenna configuration		1~6		1x2	1x2

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power
  - for  $N_{oc}$  to be fulfilled.
- Note 3: RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

# A.4.7.4.2.3 Test Requirements

The L1-RSRP measurement accuracy for CSI-RS#0 and CSI-RS#1 of Cell 2 shall fulfil the requirements in clauses 10.1.19.2.

# A.4.7.5 SFTD accuracy

# A.4.7.5.1 SFTD accuracy

# A.4.7.5.1.1 Test Purpose and Environment

The purpose of this set of tests is to verify that the SFTD measurement accuracy is within the specified limits. This test will verify the requirements as specified in clause 9.1.27 in TS 36.133 [15] for EN-DC SFTD measurements.

## A.4.7.5.1.2 Test Parameters

Supported test configurations are shown in Table A.4.7.5.1.2-1. In this set of test cases there are two cells on different carriers. Cell 1 is E-UTRAN PCell and Cell 2 is NR FR1 PSCell. The test parameters of cell 1 are given in clause A.3.7.2.1. The test parameters of cell 2 are given in Table A.4.7.5.1.2-2. The SFTD between PCell and PSCell shall be set by the test equipment to one of the time differences in Table A.4.7.5.1.2-3.

Table A.4.7.5.1.2-1: Supported test configurations for SFTD accuracy

Configuration	Description
1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD
2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD
3	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE FDD
4	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD
5	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD

	6	NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE TDD
Note:	The UE is or	nly required to be tested in one of the supported test configurations

Table A.4.7.5.1.2-2: Test parameters for SFTD accuracy

Parameter		Config	Unit	Test 1
SSB GSCN	SSB GSCN			freq1
Duplex mode		1,4		FDD
		2,5		TDD
		3,6		TDD
		1,4		N/A
TDD Configu	uration	2,5		TDDConf.1.1
		3,6		TDDConf.2.1
		1,4		10: N <sub>RB,c</sub> = 52
BW <sub>channel</sub>		2,5	MHz	10: N <sub>RB,c</sub> = 52
		3,6		40: N <sub>RB,c</sub> = 106
		1,4		SR.1.1 FDD
PDSCH Ref	erence measurement channel	2,5		SR.1.1 TDD
		3,6		SR.2.1 TDD
		1,4		CR.1.1 FDD
RMSI CORE	SET Reference Channel	2,5		CR.1.1 TDD
		3,6		CR.2.1 TDD
		1,4		CCR.1.1 FDD
RMC CORE	SET Reference Channel	2,5		CCR.1.1 TDD
		3,6		CCR.2.1 TDD
		1,4		SSB.1 FR1
SSB configu	ration	2,5		SSB.1 FR1
		3,6		SSB.2 FR1
SMTC config		1~6		SMTC.1
DL BWP cor	nfiguration	1~6		DLBWP.1.1
UL BWP cor	nfiguration	1~6		ULBWP.1.1
OCNG Patte	erns	1~6		OP.1
EPRE ratio	of PSS to SSS			
EPRE ratio	of PBCH DMRS to SSS			
EPRE ratio	of PBCH to PBCH DMRS	1~6 dB		
EPRE ratio	of PDCCH DMRS to SSS		dB	
EPRE ratio	of PDCCH to PDCCH DMRS			0
	of PDSCH DMRS to SSS			
	of PDSCH to PDSCH DMRS			
	of OCNG DMRS to SSSNote 1			
EPRE ratio	of OCNG to OCNG DMRS Note 1			
	NR_FDD_FR1_A,			
	NR_TDD_FR1_A NOTE 5	4		
	NR_FDD_FR1_B	4		
	NR_TDD_FR1_C	1		
$N_{oc}$ Note2	NR_FDD_FR1_D, NR_TDD_FR1_D	1~6	dBm/15kHz	-104
	NR FDD FR1 E,	1		
	NR TDD FR1 E			
	NR FDD FR1 G			
	NR FDD FR1 H			
	NR FDD FR1 A.			
	NR_TDD_FR1_A <sup>NOTE 5</sup>	1		
	NR_FDD_FR1_B	1		
) / N-4-0	NR_TDD_FR1_C	1	dBm/SSB SCS	
$N_{oc}^{ m Note2}$	NR_FDD_FR1_D,	1,2,4,5		-104
	NR_TDD_FR1_D	-		
	NR_FDD_FR1_E,			
	NR_TDD_FR1_E NR_FDD_FR1_G	1		
L	ואוי_רטט_רוגו_ט			

	NR FDD FR1 H			
	NR FDD FR1 A,		-	
	NR_TDD_FR1_A NOTE 5			
	NR_FDD_FR1_B			
	NR_TDD_FR1_C			
	NR_FDD_FR1_D,	3,6		-101
	NR_TDD_FR1_D	3,0		-101
	NR_FDD_FR1_E,			
	NR_TDD_FR1_E			
	NR_FDD_FR1_G			
	NR_FDD_FR1_H	_	+	
$\hat{E}_{s}/I_{ot}$		1~6	dB	-3
$\hat{E}_s/N_{oc}$		1~6	dB	-3
	NR_FDD_FR1_A,			
	NR_TDD_FR1_A NOTE 5			
	NR_FDD_FR1_B	4		
	NR_TDD_FR1_C	4		
	NR_FDD_FR1_D,	1,2,4,5		-107
	NR_TDD_FR1_D NR_FDD_FR1_E,			
	NR TDD FR1 E			
	NR FDD FR1 G			
SS-RSRP	NR FDD FR1 H			
Note3	NR FDD FR1 A,		dBm/SCS	
	NR_TDD_FR1_A NOTE 5			
	NR FDD FR1 B			
	NR TDD FR1 C			
	NR FDD FR1 D,	2.6		-104
	NR_TDD_FR1_D	3,6		-104
	NR_FDD_FR1_E,			
	NR_TDD_FR1_E			
	NR_FDD_FR1_G			
	NR_FDD_FR1_H			
	NR_FDD_FR1_A,			
	NR_TDD_FR1_A NOTE 5			
	NR_FDD_FR1_B	_		
	NR_TDD_FR1_C	_		
	NR_FDD_FR1_D, NR_TDD_FR1_D	1,2,4,5	dBm/9.36 MHz	-74.28
	NR FDD FR1 E,			
	NR TDD FR1 E			
	NR FDD FR1 G			
lo Note3	NR_FDD_FR1_H	7		
10 140169	NR FDD FR1 A,			
	NR_TDD_FR1_A NOTE 5	_		
	NR_FDD_FR1_B	_		
	NR_TDD_FR1_C	_		
	NR_FDD_FR1_D,	3,6	dBm/38.16 MHz	-68.18
	NR_TDD_FR1_D	-,-		
	NR_FDD_FR1_E, NR_TDD_FR1_E			
	NR_FDD_FR1_G	Ⅎ		
	NR_FDD_FR1_H	$\dashv$		
Propagation		1~6		AWGN
Antenna con		1~6		1x2
Antonna col	mgaration	1 1 0		١٨٤

Note 1:	OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate
	power for $N_{oc}$ to be fulfilled.
Note 3:	SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4:	SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5:	The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

Table A.4.7.5.1.2-3: Timing offsets for SFTD accuracy test

Configuration	SFN offset between PCell and PSCell	Frame boundary offset between PCell and PSCell (Ts)
1	100	-122000
2	300	-60540
3	500	1000
4	700	62540
5	900	124000

# A.4.7.5.1.3 Test Requirements

The SFTD reported by the UE consists of 2 elements, SFN offset and frame boundary offset between PCell and PSCell. The reported SFTD accuracy shall fulfil the requirement in clause 9.1.27 in TS 36.133 [15].

A.4.7.5.2 Void

A.4.7.5.3 Void

A.4.8 Void

# A.5 EN-DC tests with one or more NR cells in FR2

- A.5.1 Void
- A.5.2 Void
- A.5.3 RRC CONNECTED state mobility
- A.5.3.1 Void
- A.5.3.2 RRC Connection Mobility Control
- A.5.3.2.1 Void
- A.5.3.2.2 Random Access
- A.5.3.2.2.1 Contention based random access test in FR2 for PSCell/SCell in EN-DC
- A.5.3.2.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will verify the requirements in clause 6.2.2.2 and clause 7.1.2 in an AWGN model.

For this test two cells are used, with the configuration of Cell 1 (E-UTRA PCell) specified in clause A.3.7.2.1 and Cell 2 configured as PSCell or SCell in FR2. Supported test parameters are shown in Table A.5.3.2.2.1.1-1. UE capble of EN-DC with PSCell or SCell in FR2 needs to be tested by using the parameters in Table A.5.3.2.2.1.1-2 and Table A.5.3.2.2.1.1-3.

Table A.5.3.2.2.1.1-1: Supported test configurations for non-contention based random access test in FR2 for PSCell/SCell in EN-DC

	Config	Description		
	1	LTE FDD, NR PSCell/SCell 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex		
	'	mode		
2		LTE TDD, NR PSCell/SCell 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex		
	2	mode		
Note:	The UE is only required to be tested in one of the supported test configurations depending on UE			
	capability			

Table A.5.3.2.2.1.1-2: General test parameters for contention based random access test in FR2 for PSCell/SCell in EN-DC

Paramet	ter	Unit	Test-1	Comments
SSB Configuration	Config 1,2		SSB pattern 1 in FR2	As defined in A.3.10, except for number of SSBs per SS-burst and SS/PBCH block index as below
Number of SSBs per SS	-burst		2	Different from the definition in A.3.10
SS/PBCH block index			0,1	Different from the definition in A.3.10
Duplex Mode for Cell 2	Config 1,2		TDD	
TDD Configuration	Config 1,2		TDDConf.3.1	
OCNG Pattern Note 1			OCNG pattern 1	As defined in A.3.2.1.
PDSCH parameters Note 2	Config 1,2		SR3.X TDD	As defined in A.3.1.1.
NR RF Channel Number			1	
EPRE ratio of PSS to SS	SS	dB		
EPRE ratio of PBCH_DN	MRS to SSS	dB		
EPRE ratio of PBCH to PBCH_DMRS		dB		
EPRE ratio of PDCCH_DMRS to SSS		dB	0	
EPRE ratio of PDCCH to PDCCH_DMRS		dB		
EPRE ratio of PDSCH_D	MRS to SSS	dB		
EPRE ratio of PDSCH to	PDSCH_DMRS	dB		

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.

Note 2: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.

Table A.5.3.2.2.1.1-3: OTA-related test parameters for contention based random access test in FR2 for PSCell/SCell in EN-DC

	Parameter	Unit	Test-1	Comments
AoA setup			Setup 2b	As defined in A.3.15.2.2.
SSB with index 0	SSB_RP	dB	[10] dB larger than SSB_RP for SSB index 1	SSB with index 0 is signalled to be above configured rsrp- ThresholdSSB
SSB with index 1	SSB_RP	dB	Minimum SSB_RP value is dependent on band and power class as specified for spherical coverage AoA in Table B.2.2-2	SSB with index 1 is signalled to be below configured <i>rsrp-</i> <i>ThresholdSSB</i>
Configured U $P_{ m CMAX,f,c}$ )	JE transmitted power (	dBm	maximum value configurable for certain power class	As defined in clause 6.2.4 in TS 38.101-2.
PRACH Con	figuration		FR2 PRACH configuration 1	As defined in A.3.8.3.
preambleRe	ceivedTargetPower	dBm	-60	
Propagation	Condition	-	AWGN	
	o articial noise is applied in thoid.	nis test.		

#### A.5.3.2.2.1.2 **Test Requirements**

Contention based random access is triggered by not explicitly assigning a random access preamble via dedicated signalling in the downlink.

#### A.5.3.2.2.1.2.1 Random Access Preamble Transmission

To test the UE behavior specified in Clause 6.2.2.2.1.1 the System Simulator shall receive the Random Access Preamble which belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured *rsrp-ThresholdSSB*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -60 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.5.3.2.2.1.2.2 Random Access Response Reception

To test the UE behavior specified in Clause 6.2.2.2.1.2 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response not corresponding to the transmitted Random Access Preamble.

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

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if all received

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

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -60 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

## A.5.3.2.2.1.2.3 No Random Access Response Reception

To test the UE behavior specified in clause 6.2.2.2.1.3 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preambles.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -60 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

# A.5.3.2.2.1.2.4 Receiving an UL grant for msg3 retransmission

To test the UE behavior specified in clause 6.2.2.2.1.4 the System Simulator shall provide an UL grant for msg3 retransmission following a successful Random Access Response.

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

# A.5.3.2.2.1.2.5 Reception of an Incorrect Message over Temporary C-RNTI

To test the UE behavior specified in Clause 6.2.2.2.1.5 the System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element *not* matching the CCCH SDU transmitted in msg3 uplink message.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires unless the received message includes a UE Contention Resolution Identity MAC control element and the UE Contention Resolution Identity included in the MAC control element matches the CCCH SDU transmitted in the uplink message.

# A.5.3.2.2.1.2.6 Reception of a Correct Message over Temporary C-RNTI

To test the UE behavior specified in Clause 6.2.2.2.1.5 the System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element matching the CCCH SDU transmitted in the msg3 uplink message.

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

## A.5.3.2.2.1.2.7 Contention Resolution Timer expiry

To test the UE behavior specified in Clause 6.2.2.2.1.6 the System Simulator shall *not* send a response to a msg3.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if the Contention Resolution Timer expires.

# A.5.3.2.2.2 Non-contention based random access test in FR2 for PSCell/SCell in EN-DC

# A.5.3.2.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will verify the requirements in clause 6.2.2.2 and clause 7.1.2 in an AWGN model.

For this test two cells are used, with the configuration of Cell 1 (E-UTRA PCell) specified in clause A.3.7.2.1 and Cell 2 configured as PSCell or SCell in FR2. Supported test parameters are shown in Table A.5.3.2.2.2.1-1. UE capble of EN-DC with PSCell or SCell in FR2 needs to be tested by using the parameters in Table A.5.3.2.2.2.1-2 and Table A.5.3.2.2.2.1-3 for SSB-based non-contention based random access test (Test 1) and CSI-RS-based non-contention based random access test (Test 2).

Table A.5.3.2.2.2.1-1: Supported test configurations for non-contention based random access test in FR2 for PSCell/SCell in EN-DC

	Config	Description				
	1	LTE FDD, NR PSCell/SCell 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex				
	Į.	mode				
	2	LTE TDD, NR PSCell/SCell 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex				
2		mode				
Note:	The UE is only required to be tested in one of the supported test configurations depending on UE					
	capability					

Table A.5.3.2.2.2.1-2: General test parameters for non-contention based random access test in FR2 for PSCell/SCell in EN-DC

Parame	eter	Unit	Test-1	Test-2	Comments
SSB Configuration	Config 1,2		SSB pattern 1 in FR2	SSB pattern 1 in FR2	As defined in A.3.10,
			FR2	In FR2	except of Number of SSBs per SS-burst
					and SS/PBCH block
					index as below
Number of SSBs per	r SS-burst		2	2	Different from the
			_	_	definition in A.3.10
SS/PBCH block inde	eX		0,1	0,1	Different from the
			,	,	definition in A.3.10
CSI-RS	Config 1,2		N/A	CSI-RS.3.1	As defined in A.3.1.4
Configuration				TDD	
Duplex Mode for	Config 1,2		TDD	TDD	
Cell 2					
TDD Configuration	Config 1,2		TDDConf.3.1	TDDConf.3.1	
OCNG Pattern Note 1			OCNG pattern 1	OCNG pattern 1	As defined in A.3.2.1.
PDSCH	Config 1,2		SR3.X TDD	SR3.X TDD	As defined in A.3.1.1.
parameters Note 2					
NR RF Channel Nun			1	1	
EPRE ratio of PSS to		dB			
EPRE ratio of PBCH		dB			
EPRE ratio of PBCH	l to	dB			
PBCH_DMRS					
EPRE ratio of PDCCH_DMRS to		dB			
SSS			- 0	0	
EPRE ratio of PDCCH to		dB			
PDCCH_DMRS					
EPRE ratio of PDSCH_DMRS to SSS		dB			
EPRE ratio of PDSC PDSCH_DMRS	H to	dB			

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.

Note 2: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.

Table A.5.3.2.2.2.1-3: OTA-related test parameters for non-contention based random access test in FR2 for PSCell/SCell in EN-DC

Parameter		Unit	Test-1	Test-2	Comments
AoA setup			Setup 2b	Setup 2b	As defined in A.3.15.2.2.
SSB with index 0	SSB_RP	dB	[10] dB larger than SSB_RP for SSB index 1	[10] dB larger than SSB_RP for SSB index 1	SSB with index 0 is signalled to be above configured rsrp-ThresholdSSB
SSB with index 1	SSB_RP	dB	Minimum SSB_RP value is dependent on band and power class as specified for spherical coverage AoA in Table B.2.2-2	Minimum SSB_RP value is dependent on band and power class as specified for spherical coverage AoA in Table B.2.2-2	SSB with index 1 is signalled to be below configured <i>rsrp-</i> <i>ThresholdSSB</i>
Configured U power ( $P_{\rm CMA}$ PRACH Confi	X, f, c )	dBm	maximum value configurable for certain power class FR2 PRACH	maximum value configurable for certain power class FR2 PRACH	As defined in clause 6.2.4 in TS 38.101-2.  As defined in A.3.8.3.
preambleReceivedTargetPower		dBm	configuration 2	configuration 3	As defined in A.S.G.S.
Propagation (	Condition	-	AWGN	AWGN	

Note 1: No articial noise is applied in this test.

Note 2: void.

## A.5.3.2.2.2 Test Requirements

Non-Contention based random access is triggered by explicitly assigning a random access preamble via dedicated signalling in the downlink. In the test, the non-contention based random access procedure is not initialized for Other SI requested from UE or beam failure recovery.

### A.5.3.2.2.2.2.1 SSB-based Random Access Preamble Transmission

In Test-1, to test the UE behavior specified in Clause 6.2.2.2.2.1 for SSB-based Random Access Preamble transsision, with the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs configured, the System Simulator shall receive the Random Access Preamble which has the Preamble Index associated with the SSB with index 0.

In addition, the System Simulator shall receive the Random Access Preamble on the PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0, and the selected PRACH occasion shall belongs to the PRACH occasions permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -60 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.5.3.2.2.2.2 CSI-RS-based Random Access Preamble Transmission

In Test-2, to test the UE behavior specified in Clause 6.2.2.2.2.1 for CSI-RS-based Random Access Preamble transsision, with the contention-free Random Access Resources and the contention-free PRACH occasions

associated with CSI-RSs configured, the System Simulator shall receive the Random Access Preamble which has the Preamble Index associated with the CSI-RS configured.

In addition, the System Simulator shall receive the Random Access Preamble on the PRACH occasion which belongs to the PRACH occasions corresponding to the CSI-RS configured, and the selected PRACH occasion shall belongs to the PRACH occasions permitted by the restrictions given by the *ra-OccasionList*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -60 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

### A.5.3.2.2.2.3 Random Access Response Reception

To test the UE behavior specified in Clause 6.2.2.2.2 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response *not* corresponding to the transmitted Random Access Preamble.

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

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -60 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

# A.5.3.2.2.2.4 No Random Access Response Reception

To test the UE behavior specified in clause 6.2.2.2.2.3 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preambles.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window configured in *RACH-ConfigCommon*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -60 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

# A.5.3.2.3 Void

# A.5.4 Timing

# A.5.4.1 UE transmit timing

# A.5.4.1.1 NR UE Transmit Timing Test for FR2

# A.5.4.1.1.1 Test Purpose and environment

The purpose of this test is to verify that the UE can follow frame timing change of the connected gNodeb and that the UE initial transmit timing accuracy, maximum amount of timing change in one adjustment, minimum and maximum adjustment rate are within the specified limits. This test will verify the requirements in clause 7.1.2.

Supported test configurations are shown in Table 5.4.1.1.1-1.

Table A.5.4.1.1.1-1: Supported test configurations for FR2 PSCell

Configuration	Description				
1	LTE FDD, NR TDD, SSB SCS 240 kHz, data SCS 120 kHz, BW 100 MHz				
2	LTE TDD, NR TDD, SSB SCS 240 kHz, data SCS 120 kHz, BW 100 MHz				

The test consists of E-UTRA PCell and NR PSCell. The configuration for E-UTRA is given in A.3.7.2.1. Tables A.5.4.1.1.1-2 and A.5.4.1.1.1-2A define the parameters to be configured and strength of the transmitted signals. The transmit timing is verified by the UE transmitting SRS using the configuration defined in Table A.5.4.1.1.1-3.

Table A.5.4.1.1.1-2: Cell Specific Test Parameters for UL Transmit Timing test

Parameter	Unit	Config	Test1	Test2	Band Group
SSB ARFCN		1,2	Freq1	Freq1	
Duplex Mode		1,2	T	)D	
TDD configuration		1,2	TDDC	onf.1.2	
BW <sub>channel</sub>	MHz	1,2	100: N <sub>F</sub>	<sub>RB,c</sub> = 66	
Initial BWP Configuration		1,2	DLBW	/P.0.1	
Illitial BWF Colliguration		1,2	ULBW	/P.0.1	
Dedicated BWP		1,2	DLBW	/P.1.1	
Configuration		1,2	ULBW	/P.1.1	
TRS Configuration		1,2		.1 TDD	
TCI State		1,2	CSI-RS.	Config.0	
DRx Cycle	ms	1,2	N/A	DRX.5 <sup>Note5</sup>	
PDSCH Reference		1,2	SD 3	1 TDD	
measurement channel		1,2	SR.3.1 TDD		
CORESET Reference		1,2	CR.3.1 TDD		
Channel			CK.3.1 TDD		
OCNG Patterns		1,2	OCNG p	oattern 1	
SSB Configuration		1,2	SSB.2	2 FR2	
SMTC Configuration		1,2	SMT	ΓC.1	
PDSCH/PDCCH	kHz	1,2	1'	20	
subcarrier spacing	KI IZ	1,2	12	20	
EPRE ratio of PSS to					
SSS					
EPRE ratio of PBCH					
DMRS to SSS	dB	1,2	0	0	
EPRE ratio of PBCH to	QD.	١,٢	U		
PBCH DMRS					
EPRE ratio of PDCCH					
DMRS to SSS					

EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG				
DMRS to SSS(Note 1)				
EPRE ratio of OCNG to				
OCNG DMRS (Note 1)				
Propagation condition	1,2	AW	'GN	
SRS Config	1,2	SRSConf.1Note6	SRSConf.2Note6	

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.
- Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- SS-RSRP minimum requirements are specified assuming independent interference and noise at each Note 4: receiver antenna port.
- Note 5: DRx related parameters are given in Table A.3.3.5-1
- SRS configs are given in Table A.5.4.1.1.1-3 Note 6:

Table A.5.4.1.1.1-2A: OTA related test parameters

Parameter	Unit	Test 1	Test 2		
Angle of arrival configuration	ival configuration According to clause A.3.				
$N_{oc}^{$	dBm/15kHz <sup>Note4</sup>	-112			
$N_{oc}^{ m Note1}$	dBm/SCS <sup>Note3</sup>	-103			
$\hat{E}_s/N_{oc}$	dB	4	ļ		
SS-RSRP <sup>Note2</sup>	dBm/SCS Note4	-9	9		
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	4	ļ.		
lo <sup>Note2</sup>	dBm/95.04 MHz Note4	-68	3.5		
Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power					

- for  $N_{oc}$  to be fulfilled.
- SS-RSRP and lo levels have been derived from other parameters for information Note 2: purposes. They are not settable parameters themselves.
- SS-RSRP minimum requirements are specified assuming independent interference and Note 3: noise at each receiver antenna port.
- Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
- Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone

Table A.5.4.1.1.1-3: SRS Configuration for Timing Accuracy Test

	Field	SRSConf.1	SRSConf.2	Comments
SRS-ResourceSet	srs-ResourceSetId	0	0	
	srs-ResourceldList	0	0	
	resourceType	Periodic	Periodic	
	Usage	Codebook	Codebook	
SRS-Resource	SRS-Resourceld	0	0	
	nrofSRS-Ports	Port1	Port1	
	transmissionComb	n2	n2	
	combOffset-n2	0	0	
	cyclicShift-n2	0	0	
	resourceMapping startPosition	0	0	
	resourceMapping nrofSymbols	n1	n1	
	resourceMapping repetitionFactor	n1	n1	
	freqDomainPosition	0	0	
	freqDomainShift	0	0	
	freqHopping c-SRS	17	17	Matches N <sub>RB,c</sub>
	freqHopping b-SRS	0	0	
	freqHopping b-hop	0	0	
	groupOrSequenceHopping	Neither	Neither	
	resourceType	Periodic	Periodic	
	periodicityAndOffset-p	sl1,0	sl2560,0	Offset to align with DRx periodicity
	sequenceld	0	0	Any 10 bit number

Table A.5.4.1.1.1-4: Void

# A.5.4.1.1.2 Test requirements

The test sequence shall be carried out in RRC\_CONNECTED for every test case.

Following will be the test sequence for this test

- 1) Set up E-UTRA PCell according to parameters given in Table A.3.7.2.2-1 and setup NR PSCell according to parameters given in Table A.5.4.1.1.1-1.
- 2) After connection set up with the cell, the test equipment will verify that the timing of the NR cell is within  $(N_{TA} + N_{TA \text{ offset}}) \times T_c \pm T_c$  of the first detected path of DL SSB.
  - a. The  $N_{TA}$  offset value (in  $T_c$  units) is 13792
  - b. The  $T_e$  values depend on the DL and UL SCS for which the test is being run and are given in Table 7.1.2- 1
- 3) The test system shall adjust the timing of the DL path by values given in Table A.5.4.1.1.2-1

Table A.5.4.1.1.2-1 Adjustment Value for DL Timing

SCS of SSB signals (kHz)	Adjustment Value		
	Test1	Test2	
240	+8*64T <sub>c</sub>	+4*64T <sub>c</sub>	

- 4) The test system shall verify that the adjustment step size and the adjustment rate shall be according to requirements specified in Clause 7.1.2 Table 7.1.2-3 until the UE transmit timing offset is within ( $N_{TA} + N_{TA\_offset}$ )  $\times T_c \pm T_e$  respective to the first detected path (in time) of DL SSB. Skip this step for test 2 with DRX configured.
- 5) The test system shall verify that the UE transmit timing offset stays within  $(N_{TA} + N_{TA\_offset}) \times T_c \pm T_e$  of the first detected path of DL SSB. For Test 2 the UE transmit timing offset shall be verified for the first transmission in the DRX cycle immediately after DL timing adjustment

### A.5.4.2 UE timer accuracy

### A.5.4.3 Timing advance

### A.5.4.3.1 EN-DC FR2 timing advance adjustment accuracy

#### A.5.4.3.1.1 Test Purpose and Environment

The purpose of the test is to verify UE Timing Advance adjustment delay and accuracy requirement defined in clause 7.3.

#### A.5.4.3.1.2 Test Parameters

Supported test configurations are shown in table A.5.4.3.1.2-1. Both timing advance adjustment delay and accuracy are tested by using the parameters in table A.5.4.3.1.2-2, A.5.4.3.1.2-3, A.5.4.3.1.2-3A and A.5.4.3.1.2-4. The configuration of Cell 1 (LTE PCell) is specified in clause A.3.7.2.1.

In all test cases, two cells are used. Cell 1 is the PCell in the primary Timing Advance Group (pTAG) and cell 2 is the PSCell is in the secondary Timing Advance Group (sTAG). Each test consists of two successive time periods, with time duration of T1 and T2 respectively. In each time period, timing advance commands for sTAG are sent to the UE and Sounding Reference Signals (SRS), as specified in table A.5.4.3.1.2-3, are sent from the UE and received by the test equipment. By measuring the reception of the SRS, the transmit timing, and hence the timing advance adjustment accuracy, can be measured for PSCell in sTAG.

During time period T1, the test equipment shall send one message with a Timing Advance Command MAC Control Element for sTAG, as specified in clause 6.1.3.4 in TS 38.321 [7]. The Timing Advance Command value shall be set to 31, which according to clause 4.2 in TS 38.213 [3] results in zero adjustment of the Timing Advance. In this way, a reference value for the timing advance for sTAG used by the UE is established.

During time period T2, the test equipment shall send a sequence of messages with Timing Advance Command MAC Control Elements for sTAG, with Timing Advance Command value specified in table A.5.4.3.1.2-2. This value shall result in changes of the timing advance for sTAG used by the UE, and the accuracy of the change shall then be measured, using the SRS sent from the UE.

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

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

Table A.5.4.3.1.2-1: Timing advance supported test configurations

Config		Description
	1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
	2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations		

Table A.5.4.3.1.2-2: General test parameters for timing advance

Parameter	Unit	Value	Comment
RF channel number		Cell 1: 1	1 for E-UTRAN PCell
		Cell 2: 2	2 for NR PSCell
Initial DL BWP		DLBWP.0.1	As specified in Table A.3.9.2.1-1
Dedicated DL BWP		DLBWP.1.1	As specified in Table A.3.9.2.2-1
Initial UL BWP		ULBWP.0.1	As specified in Table A.3.9.3.1-1
Dedicated UL BWP		ULBWP.1.1	As specified in Table A.3.9.3.2-1
Timing Advance Command $(T_A)$ value during T1		31	NTA_new = NTA_old for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2
Timing Advance Command $(T_A)$ value during T2		39	For 120 kHz SCS $N_{TA\_new} = N_{TA\_old} + 1024*T_c$ (based on equation in clause 4.2 of TS 38.213 [3])
T1	S	5	
T2	S	5	

Table A.5.4.3.1.2-3: Cell specific test parameters for timing advance

Downwoodow	Unit	Test1		
Parameter	Unit	T1	T2	
Duplex mode		TD	DD .	
TDD configuration		TDDCc	onf.3.1	
BW <sub>channel</sub>	MHz	100: N <sub>R</sub>	$_{\rm B,c} = 66$	
BWP BW	MHz	100: N <sub>R</sub>	$_{\rm B,c} = 66$	
DRx Cycle	ms	Not App		
PDSCH Reference measurement channel		SR.3.1	TDD	
CORESET Reference Channel		CR.3.1	I TDD	
TRS configuration		TRS.2.	1 TDD	
TCI configuration		CSI-RS.	Config.0	
OCNG Patterns		OCNG p	attern 1	
SMTC configuration		SMTC.	1 FR2	
PDSCH/PDCCH subcarrier spacing	kHz	120	kHz	
PUCCH/PUSCH subcarrier spacing	kHz	120	kHz	
EPRE ratio of PSS to SSS				
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS	dB			
EPRE ratio of PDSCH DMRS to SSS	uБ		•	
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS(Note 1)				
EPRE ratio of OCNG to OCNG DMRS (Note				
1)				
Propagation condition	-	AW	GN	

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

Table A.5.4.3.1.2-3A: OTA related test parameters

Parameter		Unit	Test 1		
			T1	T2	
Angle of	arrival configuration		According to o	clause A.3.15.1	
$N_{oc}$ Note1		dBm/15kHz <sup>Note4</sup>	-1	112	
$N_{oc}$ Note1		dBm/SCS <sup>Note3</sup>	-103		
$\hat{E}_s/N_{od}$	c	dB	4		
SS-RSRF	Note2	dBm/SCS Note4	-99		
$\hat{\mathrm{E}}_{_{\mathrm{s}}}/\mathrm{I}_{_{\mathrm{ot}}}$		dB		4	
Io <sup>Note2</sup>		dBm/95.04 MHz <sup>Note4</sup>	-6	8.5	
Note 1:		ner cells and noise sources no riers and time and shall be m d.	•		
Note 2:		vels have been derived from other parameters for information not settable parameters themselves.			
Note 3:		requirements are specified as		t interference and	
Note 4: Note 5:		ceived by an antenna with 0d Bi gain antenna at the centre		of the quiet zone	

Table A.5.4.3.1.2-4: Sounding Reference Symbol Configuration for timing advance

Field	Value	Comment			
c-SRS	16	Fraguency hopping is disabled			
b-SRS	0	Frequency hopping is disabled			
b-hop	0				
freqDomainPosition	0	Frequency domain position of SRS			
freqDomainShift	0				
groupOrSequenceHopping	neither	No group or sequence hopping			
SRS-PeriodicityAndOffset	sl5=0	Once every 5 slots			
pathlossReferenceRS	ssb-Index=0	SSB #0 is used for SRS path loss estimation			
usage	Codebook	Codebook based UL transmission			
startPosition	0	resourceMapping setting. SRS on last			
nrofSymbols	n1	symbol of slot, and 1symbols for SRS			
repetitionFactor	n1	without repetition.			
combOffset-n2	0	transmissionComb sotting			
cyclicShift-n2	0	transmissionComb setting			
nrofSRS-Ports	port1	Number of antenna ports used for SRS transmission			
Note: For further information see clause 6.3.2 in TS 38.331 [2].					

#### A.5.4.3.1.3 Test Requirements

The UE shall apply the signalled Timing Advance value for PSCell in sTAG to the transmission timing at the designated activation time i.e. k+1 slots after the reception of the timing advance command, where k = 11.

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

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

## A.5.5 Signaling characteristics

### A.5.5.1 Radio link Monitoring

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

Editor note: The metric for the detection of the UE UL transmitted signal by the TE is FFS.

## A.5.5.1.1 Radio Link Monitoring Out-of-sync Test for FR2 PSCell configured with SSB-based RLM RS in non-DRX mode

#### A.5.5.1.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PSCell. This test will partly verify the FR2 radio link monitoring requirements in clause 8.1.

Supported test configurations are shown in table A.5.5.1.1.1-1. The test parameters are given in Tables A.5.5.1.1.1-2, A.5.5.1.1.1-3, and A. 5.5.1.1.1-4 below. There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-2. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.5.5.1.1.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. UE is configured to perform inter-frequency measurements using Gap Pattern ID #0 (40ms) in test 1.

Table A.5.5.1.1.1-1: Supported test configurations for FR2 PSCell

Configuration	Description	
1	FDD LTE PCell, NR 120 KHz SSB SCS, 100 MHz bandwidth, TDD duplex mode	
2	TDD LTE PCell, NR 120 KHz SSB SCS, 100 MHz bandwidth, TDD duplex mode	
Note: The UE is only required to pass in one of the supported test configurations in FR2		

Table A.5.5.1.1.1-2: General test parameters for FR2 out-of-sync testing in non-DRX mode

Parameter			Unit	Value	
				Test 1	
Active FLITPA	PCell			Cell 1	
Active E-UTRA PCell E-UTRA RF Channel Number				1	
Active PSCell	iailiei Nullibei			Cell 2	
RF Channel Nu	ımbor		+	2	
Duplex mode	illipei	Config 1, 2	+	TDD	
		Config 1, 2		100: N <sub>RB,c</sub> = 66	
BW <sub>channel</sub>	aanfiguration	Config 1, 2			
DL initial BWP DL dedicated E				DLBWP.0.1 DLBWP.1.1	
configuration	OVVP	Config 1, 2		DLBVVP.1.1	
UL initial BWP	aanfiguration	Config 1 0		ULBWP.0.1	
UL dedicated E		Config 1, 2 Config 1, 2		ULBWP.0.1	
or dedicated b	OVVP	Cornig 1, 2		ULBVVP.1.1	
	tion	Config 1 0		TDDConf 2 1	
TDD Configura CORESET Ref	LION	Config 1, 2		TDDConf.3.1 CR.3.1 TDD	
CORESET Rei Channel	CICIOC	Config 1, 2		CK.S.T TDD	
-	tion	Config 1 2		SSB 4 FD2	
SSB Configura		Config 1, 2		SSB.1 FR2	
SMTC Configu PDSCH/PDCC		Config 1, 2		SMTC.1 120 KHz	
	H subcarrier	Config 1, 2		120 KHZ	
spacing		Canfin 4 0		T-bl- A 2 0 2 4	
PRACH Config		Config 1, 2		Table A.3.8.3.4	
SSB index assi RS	gned as RLIVI	Config 1, 2		0,1	
OCNG parame	ters			OP.2	
CP length				Normal	
Correlation Ma	trix and Antenna	a Configuration		2x2 Low	
	DCI format			1-0	
	Number of Co	ntrol OFDM		2	
Out of sync	symbols				
transmission	Aggregation le	evel	CCE	8	
parameters	Ratio of hypot	hetical PDCCH RE	dB	4	
	energy to ave energy	rage SSS RE			
		hetical PDCCH	dB	4	
		to average SSS RE	ub	4	
	energy	to average 000 INE			
	DMRS precod	ler granularity		REG bundle size	
	REG bundle s			6	
DRX	. NEO Barraio 3			OFF	
Gap pattern ID				gp0	
Layer 3 filtering	i			gpo Enabled	
T310 timer	1		ms	0	
T310 timer T311 timer			ms	1000	
N310			1113	1000	
N311			1		
CSI-RS for CSI reporting Config 1, 2		+	CSI-RS.3.1 TDD		
	reporting PDCCH/PDSCH		+	TCI.State.2	
				TRS.2.1 TDD	
CSI-RS for trac	King	Config 1, 2		0.2	
T1			S		
T2			S	9.68	
T3			S	9.68	
D1			S	9.64	

All configurations are assigned to the UE prior to the start of time period T1. UE-specific PDCCH is not transmitted after T1 starts. Note 1:

Note 2:

Note 3: E-UTRAN is in non-DRX mode under test.

Table A.5.5.1.1.1-3: OTA related cell specific test parameters for FR2 (Cell 2) for out-of-sync radio link monitoring tests in non-DRX mode

Param	Unit		Test 1		
			T1	T2	T3
AoA setup		Setup	3 defined in	A.3.15	
EPRE ratio of PDCCH	DMRS to SSS	dB		4	
EPRE ratio of PDCCH	to PDCCH DMRS	dB		0	
EPRE ratio of PBCH D	MRS to SSS	dB			
EPRE ratio of PBCH to	PBCH DMRS	dB			
EPRE ratio of PSS to S	SSS	dB			
EPRE ratio of PDSCH	DMRS to SSS	dB		0	
EPRE ratio of PDSCH	to PDSCH DMRS	dB			
EPRE ratio of OCNG D	MRS to SSS	dB			
EPRE ratio of OCNG to	OCNG DMRS	dB			
ssb-Index 0 SNR	Config 1, 2	dB	2	-6	-15
ssb-Index 1 SNR	Config 1, 2		2	-15	-15
SNR on other channels and signals	dB		2		
N <sub>oc</sub> Config 1, 2		dBm/1 5KHz		-92.1dBm	
Propagation condition			TD	L-A 30ns 75	iHz

Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.

Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.

Note 4: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR

during T3 is A.3.6.

Table A.5.5.1.1.1-4: Measurement gap configuration for out-of-sync tests in non-DRX mode

Field	Test 1	
Field	Value	
gapOffset	0	
	ame boundary aligned. RS is partially overlapped with	

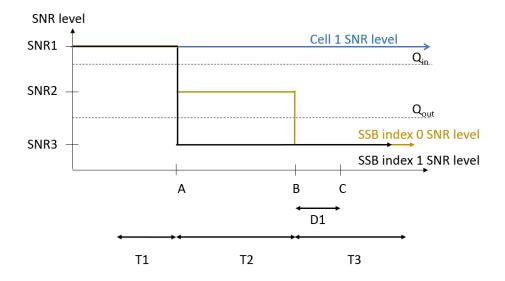


Figure A.5.5.1.1.1-1: SNR variation for out-of-sync testing

#### A.5.5.1.1.2 Test Requirements

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

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

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

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

## A.5.5.1.2 Radio Link Monitoring In-sync Test for FR2 PSCell configured with SSB-based RLM RS in non-DRX mode

#### A.5.5.1.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PSCell. This test will partly verify the FR2 radio link monitoring requirements in clause 8.1.

Supported test configurations are shown in table A.5.5.1.2.1-1. The test parameters are given in Tables A.5.5.1.2.1-2, and A.5.5.1.2.1-3 below. There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-2. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.5.5.1.2.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms.

Table A.5.5.1.2.1-1: Supported test configurations for FR2 PSCell

Configuration Description			
1	FDD LTE PCell, NR 120 KHz SSB SCS, 100 MHz bandwidth, TDD duplex mode		
2	TDD LTE PCell, NR 120 KHz SSB SCS, 100 MHz bandwidth, TDD duplex mode		
Note: The UE is only required to pass in one of the supported test configurations in FR2			

Table A.5.5.1.2.1-2: General test parameters for FR2 in-sync testing in non-DRX mode

Parameter			Unit	Value	
			-	Test 1	
Active E-UTRA PCell				Ce1l 1	
	E-UTRA RF Channel Number			1	
Active PSCell				Cell 2 2	
RF Channel Nu Duplex mode	umber	Config 1, 2		Z TDD	
BW <sub>channel</sub>		Config 1, 2		100: N <sub>RB,c</sub> = 66	
DL initial BWP	configuration	Config 1, 2		DLBWP.0.1	
DL dedicated E		Config 1, 2		DLBWP.1.1	
configuration		3 cmg 1, 2			
UL initial BWP	configuration	Config 1, 2		ULBWP.0.1	
UL dedicated E	BWP	Config 1, 2		ULBWP.1.1	
configuration					
TDD Configura		Config 1, 2		TDDConf.3.1	
CORESET Ref	erence	Config 1, 2		CR.3.1 TDD	
Channel	tion	Config 1 2	<del>                                     </del>	CCD 4 FD2	
SSB Configura SMTC Configu		Config 1, 2 Config 1, 2		SSB.1 FR2 SMTC.3	
PDSCH/PDCC		Config 1, 2		120 KHz	
spacing	i i subcalliel	Coming 1, 2		IZU NAZ	
PRACH Config	uration	Config 1, 2		Table A.3.8.3.4	
SSB index assi		Config 1, 2		0,1	
RS	9	, , _		-,-	
OCNG parame	ters			OP.2	
CP length				Normal	
	trix and Antenna	Configuration		2x2 Low	
In sync	DCI format			1-0	
transmission		ntrol OFDM symbols	205	2	
parameters	Aggregation le		CCE	4	
		netical PDCCH RE age SSS RE energy	dB	0	
		netical PDCCH	dB	0	
		to average SSS RE	QD	0	
	energy	to are age eee ra			
	DMRS precod	er granularity		REG bundle size	
	REG bundle si	ize		6	
Out of sync	DCI format			1-0	
transmission		ntrol OFDM symbols		2	
parameters	Aggregation le		CCE	8	
		netical PDCCH RE	dB	4	
		age SSS RE energy	40	4	
		netical PDCCH to average SSS RE	dB	4	
	energy	to average 333 NE			
	DMRS precod	er granularity		REG bundle size	
REG bundle size				6	
DRX				OFF	
Gap pattern ID				N.A.	
Layer 3 filtering				Enabled	
T310 timer			ms	4000	
T311 timer			ms	1000	
N310				1	
N311	l roportir -	Config 1 0		1	
CSI-RS for CS		Config 1, 2		CSI-RS.3.1 TDD	
	PDCCH/PDSCH	Config 1 2	<del>                                     </del>	TCI.State.2 TRS.2.1 TDD	
CSI-RS for tracking Config 1, 2				1173.2.1 100	

T1		S	0.2
T2		S	0.2
Т3		S	1.88
T4		S	0.2
T5		S	3.84
D1		S	3.8
Note 1:	All configurations are assigned to the UE p	rior to the st	art of time period T1.
Note 2:	Note 2: UE-specific PDCCH is not transmitted after T1 starts.		
Note 3:	F-UTRAN is in non-DRX mode under test.		

Table A.5.5.1.2.1-3: OTA related cell specific test parameters for FR2 (Cell 2) for in-sync radio link monitoring tests in non-DRX mode

Paran	Unit	Test 1					
			T1	T2	Т3	T4	T5
AoA setup			Setup 3	defined	in A.3.15		
EPRE ratio of PDCCH D	MRS to SSS	dB	4				
EPRE ratio of PDCCH to	dB			0			
EPRE ratio of PBCH DM	IRS to SSS	dB					
EPRE ratio of PBCH to F	PBCH DMRS	dB					
EPRE ratio of PSS to SS	SS	dB					
EPRE ratio of PDSCH D	MRS to SSS	dB			0		
EPRE ratio of PDSCH to	PDSCH DMRS	dB					
EPRE ratio of OCNG DN	MRS to SSS	dB					
EPRE ratio of OCNG to	OCNG DMRS	dB					
ssb-Index 0 SNR	Config 1, 2	dB	2	-6	-15	-4.5	2
ssb-Index 1 SNR	Config 1, 2		2	-15	-15	-15	-15
SNR on other channels	Config 1, 2	dB			2		
and signals							
$N_{oc}$	Config 1, 2	dBm/1	-92.1dBm				
**		5KHz	-92. IUBIII				
Propagation condition					-A 30ns		
	e used such that the res						stant
	ed power spectral densit						
•	ntains PDCCH for UEs o					art of OC	NG.
Note 3: SNR levels correspond to the signal to noise ratio over the SSS RFs.							

Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.

Note 4: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6.

#### Table A.5.5.1.2.1-4: Void

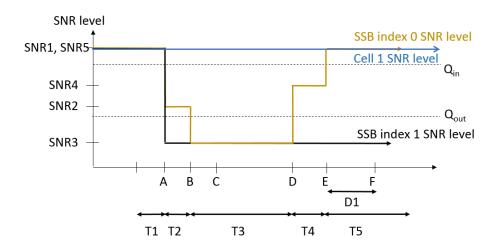


Figure A.5.5.1.2.1-1: SNR variation for in-sync testing

#### A.5.5.1.2.2 Test Requirements

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

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

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

# A.5.5.1.3 Radio Link Monitoring Out-of-sync Test for FR2 PSCell configured with SSB-based RLM RS in DRX mode

#### A.5.5.1.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PSCell when DRX is used. This test will partly verify the FR2 radio link monitoring requirements in clause 8.1.

Supported test configurations are shown in table A.5.5.1.3.1-1. The test parameters are given in Tables A.5.5.1.3.1-2, and A.5.5.1.3.1-3. There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-2. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.5.5.1.3.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

Table A.5.5.1.3.1-1: Supported test configurations for FR2 PSCell

Configuration	Description			
1	FDD LTE PCell, NR 120 KHz SSB SCS, 100 MHz bandwidth, TDD duplex mode			
2	TDD LTE PCell, NR 120 KHz SSB SCS, 100 MHz bandwidth, TDD duplex mode			
Note: The l	JE is only required to pass in one of the supported test configurations in FR2			

Table A.5.5.1.3.1-2: General test parameters for FR2 out-of-sync testing in DRX mode

Parameter		Unit	Value	
				Test 1
Active E-UTRA				Cell 1
E-UTRA RF Ch	annel Number			1
Active PSCell				Cell 2
RF Channel Nu	mber			2
Duplex mode		Config 1, 2		TDD
BW <sub>channel</sub>		Config 1, 2		100: N <sub>RB,c</sub> = 66
DL initial BWP	configuration	Config 1, 2		DLBWP.0.1
DL dedicated BWP Config 1, 2			DLBWP.1.1	
configuration				
UL initial BWP		Config 1, 2		ULBWP.0.1
UL dedicated B	WP	Config 1, 2		ULBWP.1.1
configuration				
TDD Configurat		Config 1, 2		TDDConf.3.1
CORESET Refe	erence	Config 1, 2		CR.3.1 TDD
Channel				
SSB Configurat		Config 1, 2		SSB.1 FR2
SMTC Configur		Config 1, 2		SMTC.1
PDSCH/PDCCI	H subcarrier	Config 1, 2		120 KHz
spacing				
PRACH Configu		Config 1, 2		Table A.3.8.3.4
SSB index assign	gned as RLM	Config 1, 2		0,1
RS				
OCNG paramet	ers			OP.1
CP length				Normal
Correlation Mat	rix and Antenna	Configuration		2x2 Low
Out of sync	DCI format			1-0
transmission	Number of Co	ntrol OFDM symbols		2
parameters	Aggregation le		CCE	8
	Ratio of hypot	hetical PDCCH RE	dB	4
		age SSS RE energy		
		hetical PDCCH	dB	4
		to average SSS RE		
	energy			
	DMRS precod			REG bundle size
	REG bundle s	ize		6
DRX Configurat	tion			DRX.3
Gap pattern ID				N.A.
Layer 3 filtering				Enabled
T310 timer			ms	0
T311 timer			ms	1000
N310				1
N311		T =		1
CSI-RS for CSI		Config 1, 2	ļļ	CSI-RS.3.1 TDD
TCI states for P		T =		TCI.State.2
CSI-RS for trac	king	Config 1, 2		TRS.2.1 TDD
T1			s	0.2
T2			s	14.48
T3			S	14.48
D1			S	14.44
		e assigned to the UE p		art of time period T1.
		is not transmitted afte		
Note 3: E-UT	KAN IS IN NON-	ORX mode under test.		

Table A.5.5.1.3.1-3: OTA related cell specific test parameters for FR2 (Cell 2) for out-of-sync radio link monitoring tests in DRX mode

Paramet	Parameter			Test 1		
			T1	T2	Т3	
AoA setup		Setup 1 defined in A.3.15				
EPRE ratio of PDCCH DM	IRS to SSS	dB		4		
EPRE ratio of PDCCH to F	PDCCH DMRS	dB		0		
EPRE ratio of PBCH DMR	S to SSS	dB				
EPRE ratio of PBCH to PE	3CH DMRS	dB				
EPRE ratio of PSS to SSS	3	dB				
EPRE ratio of PDSCH DM	IRS to SSS	dB	0			
EPRE ratio of PDSCH to F	dB					
EPRE ratio of OCNG DMF	RS to SSS	dB				
EPRE ratio of OCNG to O	CNG DMRS	dB				
ssb-Index 0 SNR	Config 1, 2	dB	2	-6	-15	
ssb-Index 1 SNR	Config 1, 2		2	-15	-15	
SNR on other channels and signals	Config 1, 2	dB	2			
$N_{oc}$	Config 1, 2	dBm/15K Hz	-104.7dBm			
Propagation condition			-	TDL-A 30ns 75H	<u></u>	

Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.

Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.

Note 4: The SNR values are specified for testing a UE which supports 2RX on at least one band. For

testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6.

Table A.5.5.1.3.1-4: Void Table A.5.5.1.3.1-5: Void

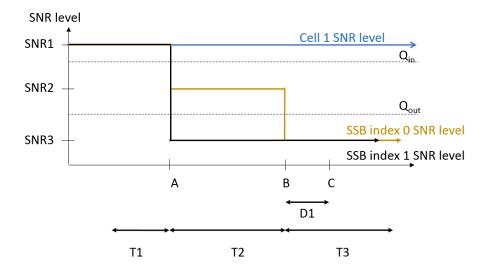


Figure A.5.5.1.3.1-1: SNR variation for out-of-sync testing

#### A.5.5.1.3.2 Test Requirements

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

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

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

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

# A.5.5.1.4 Radio Link Monitoring In-sync Test for FR2 PSCell configured with SSB-based RLM RS in DRX mode

#### A.5.5.1.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PSCell when DRX is used. This test will partly verify the FR2 radio link monitoring requirements in clause 8.1.

Supported test configurations are shown in table A.5.5.1.4.1-1. The test parameters are given in Tables A.5.5.1.4.1-2, and A.5.5.1.4.1-3. There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-2. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.5.5.1.4.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

Table A.5.5.1.4.1-1: Supported test configurations for FR2 PSCell

Configuration	Description				
1	FDD LTE PCell, NR 120 KHz SSB SCS, 100 MHz bandwidth, TDD duplex mode				
2	TDD LTE PCell, NR 120 KHz SSB SCS, 100 MHz bandwidth, TDD duplex mode				
Note: The	JE is only required to pass in one of the supported test configurations in FR2				

Table A.5.5.1.4.1-2: General test parameters for FR2 in-sync testing in DRX mode

Parameter		Unit	Value
			Test 1
Active E-UTRA PCell			Cell 1
E-UTRA RF Channel Number			1
Active PSCell			Cell 2
RF Channel Number			2
Duplex mode	Config 1, 2		TDD
BW <sub>channel</sub>	Config 1, 2		100: N <sub>RB,c</sub> = 66
DL initial BWP configuration	Config 1, 2		DLBWP.0.1
DL dedicated BWP configuration	Config 1, 2		DLBWP.1.1
UL initial BWP configuration	Config 1, 2		ULBWP.0.1
UL dedicated BWP configuration	Config 1, 2		ULBWP.1.1
TDD Configuration	Config 1, 2		TDDConf.3.1

Channel   SSB Configuration   Config 1, 2   SSB.1 FR2   SMTC.3	CORESET Ref	erence	Config 1, 2		CR.3.1 TDD
SMTC Configuration			, , _		0
SMTC Configuration	SSB Configura	tion	Config 1, 2		SSB.1 FR2
PDSCH/PDCCH subcarrier   Spacing   PRACH Configuration   Config 1, 2   Table A.3.8.3.4	SMTC Configu	ration	Config 1, 2		SMTC.3
PRACH Configuration					120 KHz
SSB index assigned as RLM   Config 1, 2   0,1					
RS	PRACH Config	PRACH Configuration Config 1,			Table A.3.8.3.4
OCNG parameters		gned as RLM	Config 1, 2		0,1
CP length					
Description   Correlation   Matrix and Antenna Configuration   Description   Descrip		ters			
In sync transmission parameters					
Transmission parameters			Configuration		
Aggregation level					
Ratio of hypothetical PDCCH RE energy to average SSS RE energy Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy DMRS precoder granularity REG bundle size 6 6 DCI format 1-0 Number of Control OFDM symbols 2 Aggregation level Ratio of hypothetical PDCCH B Aggregation level Ratio of hypothetical PDCCH B Aggregation level Aggregation level Aggregation level Aggregation level Aggregation level BMRS percoder granularity REG bundle size 8 Aggregation level Aggregation level Aggregation level BMRS energy to average SSS RE energy Ratio of hypothetical PDCCH BMRS energy to average SSS RE energy DMRS precoder granularity REG bundle size 6 BMRX.11 Agaptation DRX.11 Agaptation DRX.11 BMRS precoder granularity REG bundle size BMRX.11 BMRS precoder granularity REG bundle size BMRX.11 BMRS.11					
energy to average SSS RE energy	parameters				
Ratio of hypothetical PDCCH   DMRS energy to average SSS RE   energy				dB	0
DMRS energy to average SSS RE energy					_
energy				dB	0
DMRS precoder granularity   REG bundle size   6			to average SSS RE		
REG bundle size					DEO hamalla air-a
Dut of sync transmission parameters					
Number of Control OFDM symbols   2   Aggregation level   CCE   8   Ratio of hypothetical PDCCH RE energy to average SSS RE energy   Ratio of hypothetical PDCCH   DMRS energy to average SSS RE energy   DMRS precoder granularity   REG bundle size   6   DRX Configuration   DRX.11   Gap pattern ID   N.A.   Layer 3 filtering   Enabled   T310 timer   ms   1000   N310   ms   1000   N311   CSI-RS for CSI reporting   Config 1, 2   CSI-RS.3.1 TDD   TCI states for PDCCH/PDSCH   TCI.State.2   CSI-RS for tracking   Config 1, 2   TRS.2.1 TDD   T1   S   0.2   T3   S   2.8   T4   S   0.2   T5   S   3.88   S   3.88   S   CSI-RS in tracking   Co. CCE   RS   RS   RS   RS   RS   RS   RS   R	Out of our		ze		
Parameters			tral OFDM averabala		
Ratio of hypothetical PDCCH RE energy to average SSS RE energy   Ratio of hypothetical PDCCH   DMRS energy to average SSS RE energy   DMRS precoder granularity   REG bundle size   REG bundle				005	
energy to average SSS RE energy   Ratio of hypothetical PDCCH   DMRS energy to average SSS RE   energy   DMRS precoder granularity   REG bundle size   REG bundle size   6   DRX Configuration   DRX.11   Gap pattern ID   N.A.   Layer 3 filtering   Enabled   Enabled   T310 timer   ms   4000   T311 timer   ms   1000   N310   T   CSI-RS for CSI reporting   Config 1, 2   CSI-RS.3.1 TDD   TCI states for PDCCH/PDSCH   TCI.State.2   CSI-RS for tracking   Config 1, 2   TRS.2.1 TDD   T1   s   0.2   T3   s   0.2   T3   S   0.2   T4   S   0.2   T5   S   3.88   S   3.88	parameters	Aggregation lev	etiaal DDCCU DE		
Ratio of hypothetical PDCCH   DMRS energy to average SSS RE   energy   DMRS precoder granularity   REG bundle size   REG bundle size   6   DRX Configuration   DRX.11   Gap pattern ID   N.A.   Layer 3 filtering   Enabled   T310 timer   ms   4000   T311 timer   ms   1000   N310   1   N311   1   CSI-RS for CSI reporting   Config 1, 2   CSI-RS.3.1 TDD   TCI states for PDCCH/PDSCH   TCI.State.2   CSI-RS for tracking   Config 1, 2   TRS.2.1 TDD   T1   S   0.2   T2   S   0.2   T3   S   2.8   T4   S   0.2   T5   S   3.88				aв	4
DMRS energy to average SSS RE energy   DMRS precoder granularity   REG bundle size   6					
energy   DMRS precoder granularity   REG bundle size   6     DRX Configuration   DRX.11     Gap pattern ID   N.A.     Layer 3 filtering   Enabled     T310 timer   ms   4000     T311 timer   ms   1000     N310   1     N311   1     CSI-RS for CSI reporting   Config 1, 2   CSI-RS.3.1 TDD     TCI states for PDCCH/PDSCH   TCI.State.2     CSI-RS for tracking   Config 1, 2   TRS.2.1 TDD     T1   s   0.2     T2   s   0.2     T3   s   2.8     T4   s   0.2     T5   s   3.88				٩D	4
DMRS precoder granularity   REG bundle size   6		Ratio of hypoth	etical PDCCH	dB	4
REG bundle size         6           DRX Configuration         DRX.11           Gap pattern ID         N.A.           Layer 3 filtering         Enabled           T310 timer         ms         4000           T311 timer         ms         1000           N310         1         1           N311         1         CSI-RS for CSI reporting         Config 1, 2           TCI states for PDCCH/PDSCH         TCI.State.2           CSI-RS for tracking         Config 1, 2         TRS.2.1 TDD           T1         s         0.2           T2         s         0.2           T3         s         2.8           T4         s         0.2           T5         s         3.88		Ratio of hypoth DMRS energy t	etical PDCCH	dB	4
DRX Configuration         DRX.11           Gap pattern ID         N.A.           Layer 3 filtering         Enabled           T310 timer         ms         4000           T311 timer         ms         1000           N310         1         1           N311         1         CSI-RS for CSI reporting         Config 1, 2           TCI states for PDCCH/PDSCH         TCI.State.2         TCI.State.2           CSI-RS for tracking         Config 1, 2         TRS.2.1 TDD           T1         s         0.2           T2         s         0.2           T3         s         2.8           T4         s         0.2           T5         s         3.88		Ratio of hypoth DMRS energy t energy	etical PDCCH to average SSS RE	dB	·
Gap pattern ID         N.A.           Layer 3 filtering         Enabled           T310 timer         ms         4000           T311 timer         ms         1000           N310         1         1           N311         1         CSI-RS for CSI reporting         Config 1, 2           TCI states for PDCCH/PDSCH         TCI.State.2         TCI.State.2           CSI-RS for tracking         Config 1, 2         TRS.2.1 TDD           T1         s         0.2           T2         s         0.2           T3         s         2.8           T4         s         0.2           T5         s         3.88		Ratio of hypoth DMRS energy t energy DMRS precode	etical PDCCH to average SSS RE er granularity	dB	REG bundle size
Layer 3 filtering         Enabled           T310 timer         ms         4000           T311 timer         ms         1000           N310         1         1           N311         1         CSI-RS for CSI reporting         Config 1, 2           TCI states for PDCCH/PDSCH         TCI.State.2         TCI.State.2           CSI-RS for tracking         Config 1, 2         TRS.2.1 TDD           T1         s         0.2           T2         s         0.2           T3         s         2.8           T4         s         0.2           T5         s         3.88	DRX Configura	Ratio of hypoth DMRS energy t energy DMRS precode REG bundle siz	etical PDCCH to average SSS RE er granularity	dB	REG bundle size 6
T310 timer         ms         4000           T311 timer         ms         1000           N310         1         1           N311         1         CSI-RS for CSI reporting         Config 1, 2         CSI-RS.3.1 TDD           TCI states for PDCCH/PDSCH         TCI.State.2         TCI.State.2           CSI-RS for tracking         Config 1, 2         TRS.2.1 TDD           T1         s         0.2           T2         s         0.2           T3         s         2.8           T4         s         0.2           T5         s         3.88		Ratio of hypoth DMRS energy t energy DMRS precode REG bundle siz	etical PDCCH to average SSS RE er granularity	dB	REG bundle size 6 DRX.11
T311 timer         ms         1000           N310         1           N311         1           CSI-RS for CSI reporting         Config 1, 2         CSI-RS.3.1 TDD           TCI states for PDCCH/PDSCH         TCI.State.2           CSI-RS for tracking         Config 1, 2         TRS.2.1 TDD           T1         s         0.2           T2         s         0.2           T3         s         2.8           T4         s         0.2           T5         s         3.88	Gap pattern ID	Ratio of hypoth DMRS energy t energy DMRS precode REG bundle siz	etical PDCCH to average SSS RE er granularity	dB	REG bundle size 6 DRX.11 N.A.
N310         1           N311         1           CSI-RS for CSI reporting         Config 1, 2         CSI-RS.3.1 TDD           TCI states for PDCCH/PDSCH         TCI.State.2           CSI-RS for tracking         Config 1, 2         TRS.2.1 TDD           T1         s         0.2           T2         s         0.2           T3         s         2.8           T4         s         0.2           T5         s         3.88	Gap pattern ID Layer 3 filtering	Ratio of hypoth DMRS energy t energy DMRS precode REG bundle siz	etical PDCCH to average SSS RE er granularity		REG bundle size 6 DRX.11 N.A. Enabled
N311         1           CSI-RS for CSI reporting         Config 1, 2         CSI-RS.3.1 TDD           TCI states for PDCCH/PDSCH         TCI.State.2           CSI-RS for tracking         Config 1, 2         TRS.2.1 TDD           T1         s         0.2           T2         s         0.2           T3         s         2.8           T4         s         0.2           T5         s         3.88	Gap pattern ID Layer 3 filtering T310 timer	Ratio of hypoth DMRS energy t energy DMRS precode REG bundle siz	etical PDCCH to average SSS RE er granularity	ms	REG bundle size 6 DRX.11 N.A. Enabled 4000
CSI-RS for CSI reporting         Config 1, 2         CSI-RS.3.1 TDD           TCI states for PDCCH/PDSCH         TCI.State.2           CSI-RS for tracking         Config 1, 2         TRS.2.1 TDD           T1         s         0.2           T2         s         0.2           T3         s         2.8           T4         s         0.2           T5         s         3.88	Gap pattern ID Layer 3 filtering T310 timer T311 timer	Ratio of hypoth DMRS energy t energy DMRS precode REG bundle siz	etical PDCCH to average SSS RE er granularity	ms	REG bundle size 6 DRX.11 N.A. Enabled 4000 1000
TCI states for PDCCH/PDSCH         TCI.State.2           CSI-RS for tracking         Config 1, 2         TRS.2.1 TDD           T1         s         0.2           T2         s         0.2           T3         s         2.8           T4         s         0.2           T5         s         3.88	Gap pattern ID Layer 3 filtering T310 timer T311 timer N310	Ratio of hypoth DMRS energy t energy DMRS precode REG bundle siz	etical PDCCH to average SSS RE er granularity	ms	REG bundle size 6 DRX.11 N.A. Enabled 4000 1000
CSI-RS for tracking         Config 1, 2         TRS.2.1 TDD           T1         s         0.2           T2         s         0.2           T3         s         2.8           T4         s         0.2           T5         s         3.88	Gap pattern ID Layer 3 filtering T310 timer T311 timer N310 N311	Ratio of hypoth DMRS energy t energy DMRS precode REG bundle siz tion	etical PDCCH to average SSS RE or granularity te	ms	REG bundle size 6 DRX.11 N.A. Enabled 4000 1000 1
T1     s     0.2       T2     s     0.2       T3     s     2.8       T4     s     0.2       T5     s     3.88	Gap pattern ID Layer 3 filtering T310 timer T311 timer N310 N311 CSI-RS for CS	Ratio of hypoth DMRS energy t energy DMRS precode REG bundle siz tion	etical PDCCH to average SSS RE or granularity te	ms	REG bundle size 6 DRX.11 N.A. Enabled 4000 1000 1 1 CSI-RS.3.1 TDD
T2     s     0.2       T3     s     2.8       T4     s     0.2       T5     s     3.88	Gap pattern ID Layer 3 filtering T310 timer T311 timer N310 N311 CSI-RS for CSI TCI states for F	Ratio of hypoth DMRS energy tenergy DMRS precode REG bundle sizition  I reporting PDCCH/PDSCH	etical PDCCH to average SSS RE or granularity te Config 1, 2	ms	REG bundle size 6 DRX.11 N.A. Enabled 4000 1000 1 CSI-RS.3.1 TDD TCI.State.2
T3     s     2.8       T4     s     0.2       T5     s     3.88	Gap pattern ID Layer 3 filtering T310 timer T311 timer N310 N311 CSI-RS for CSI TCI states for F CSI-RS for trace	Ratio of hypoth DMRS energy tenergy DMRS precode REG bundle sizition  I reporting PDCCH/PDSCH	etical PDCCH to average SSS RE or granularity te Config 1, 2	ms ms	REG bundle size 6 DRX.11 N.A. Enabled 4000 1000 1 CSI-RS.3.1 TDD TCI.State.2 TRS.2.1 TDD
T4         s         0.2           T5         s         3.88	Gap pattern ID Layer 3 filtering T310 timer T311 timer N310 N311 CSI-RS for CSI TCI states for F CSI-RS for trac T1	Ratio of hypoth DMRS energy tenergy DMRS precode REG bundle sizition  I reporting PDCCH/PDSCH	etical PDCCH to average SSS RE or granularity te Config 1, 2	ms ms	REG bundle size 6 DRX.11 N.A. Enabled 4000 1000 1 CSI-RS.3.1 TDD TCI.State.2 TRS.2.1 TDD 0.2
T5 s 3.88	Gap pattern ID Layer 3 filtering T310 timer T311 timer N310 N311 CSI-RS for CSI TCI states for F CSI-RS for trac T1 T2	Ratio of hypoth DMRS energy tenergy DMRS precode REG bundle sizition  I reporting PDCCH/PDSCH	etical PDCCH to average SSS RE or granularity te Config 1, 2	ms ms	REG bundle size 6 DRX.11 N.A. Enabled 4000 1000 1 CSI-RS.3.1 TDD TCI.State.2 TRS.2.1 TDD 0.2 0.2
	Gap pattern ID Layer 3 filtering T310 timer T311 timer N310 N311 CSI-RS for CSI TCI states for F CSI-RS for trac T1 T2 T3	Ratio of hypoth DMRS energy tenergy DMRS precode REG bundle sizition  I reporting PDCCH/PDSCH	etical PDCCH to average SSS RE or granularity te Config 1, 2	ms ms s s	REG bundle size 6 DRX.11 N.A. Enabled 4000 1000 1 CSI-RS.3.1 TDD TCI.State.2 TRS.2.1 TDD 0.2 0.2 2.8
	Gap pattern ID Layer 3 filtering T310 timer T311 timer N310 N311 CSI-RS for CSI TCI states for F CSI-RS for trac T1 T2 T3 T4	Ratio of hypoth DMRS energy tenergy DMRS precode REG bundle sizition  I reporting PDCCH/PDSCH	etical PDCCH to average SSS RE or granularity te Config 1, 2	ms ms s s s	REG bundle size 6 DRX.11 N.A. Enabled 4000 1000 1 CSI-RS.3.1 TDD TCI.State.2 TRS.2.1 TDD 0.2 0.2 2.8 0.2

All configurations are assigned to the UE prior to the start of time period T1. UE-specific PDCCH is not transmitted after T1 starts. Note 1:

Note 2:

E-UTRAN is in non-DRX mode under test. Note 3:

Table A.5.5.1.4.1-3: OTA related cell specific test parameters for FR2 (Cell 2) for in-sync radio link monitoring test in DRX mode

Parai	neter	Unit	Test 1				
			T1	T2	T3	T4	T5
AoA setup			Setup 1	defined	in A.3.1	15	
EPRE ratio of PDCCH [	OMRS to SSS	dB			4		
EPRE ratio of PDCCH t	o PDCCH DMRS	dB			0		
EPRE ratio of PBCH DN	MRS to SSS	dB					
EPRE ratio of PBCH to	PBCH DMRS	dB					
EPRE ratio of PSS to S	SS	dB					
EPRE ratio of PDSCH [	MRS to SSS	dB			0		
EPRE ratio of PDSCH t	o PDSCH DMRS	dB					
EPRE ratio of OCNG D	MRS to SSS	dB					
EPRE ratio of OCNG to	OCNG DMRS	dB					
ssb-Index 0 SNR	Config 1, 2	dB	2	-6	-15	-4.5	2
ssb-Index 1 SNR	Config 1, 2		2	-15	-15	-15	-15
SNR on other	Config 1, 2	dB			2		
channels and signals							
$N_{oc}$	Config 1, 2	dBm/1 5KHz	-104.7dBm				
Propagation condition		JIXI IZ		TDI	-A 30ns	75Hz	
FTOPAGALIOTI COTTUILIOTI				100		7 3172	

Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.3

Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.

Note 4: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6.

Table A.5.5.1.4.1-4: Void Table A.5.5.1.4.1-5: Void

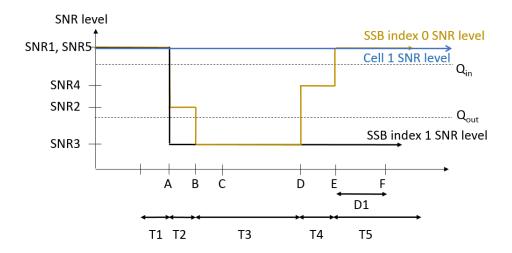


Figure A.5.5.1.4.1-1: SNR variation for in-sync testing.

#### A.5.5.1.4.2 Test Requirements

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

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

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

## A.5.5.1.5 EN-DC Radio Link Monitoring Out-of-sync Test for FR2 PSCell configured with CSI-RS-based RLM in non-DRX mode

#### A.5.5.1.5.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PSCell when no DRX is used. This test will partly verify the FR2 TDD PSCell CSI-RS Out-of-sync radio link monitoring requirements in clause 8.1.

The test parameters are given in Tables A.5.5.1.5.1-1, A.5.5.1.5.1-2, A.5.5.1.5.1-3 and A.5.5.1.5.1-3A below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.5.5.1.5.1-1 shows the variation of the downlink SNR in the E-UTRAN PCell and the PSCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms). In the test, SSB0 and SSB1 are configured as BFD-RS.

Table A.5.5.1.5.1-1: Supported test configurations for FR2 PSCell

Configuration	puration Description		
1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode		
2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode		
Note: The UE is only required to pass in one of the supported test configurations in FR2			

Table A.5.5.1.5.1-2: General test parameters for FR2 PSCell for CSI-RS out-of-sync testing in non-DRX mode

	Parameter	Unit	Value
			Test 1
Active E-UTRA PCell			Cell 1
E-UTRA RF Channel	Number		1
Active PSCell			Cell 2
RF Channel Number			2
Duplex Mode			TDD
TDD Configuration	Config 1		TDDConf.3.1
	Config 2		TDDConf.3.1

DL initial BWP	Config 1, 2		DLBWP.0.1
configuration			
DL dedicated BWP	Config 1, 2		DLBWP.1.1
configuration	0.5.4.0		LII DIMD 0.4
UL initial BWP	Config 1, 2		ULBWP.0.1
configuration UL dedicated BWP	Config 1, 2		ULBWP.1.1
	Cornig 1, 2		ULBWP.1.1
configuration RMC CORESET	Config 1		CCR.3.1 TDD
Reference Channel	Conlig 1		CCR.3.1 TDD
Reference Charmer	Config 2	}	CCR.3.1 TDD
	Cornig 2		CCR.3.1 TDD
SSB Configuration	Config 1		SSB.1 FR2
33D Corniguration	Config 2	-	SSB.1 FR2
SMTC Configuration	Config 1		SMTC.1
Swite Configuration	<u> </u>	-	
DD0011/DD0011	Config 2		SMTC.1
PDSCH/PDCCH	Config 1		120 KHz
subcarrier spacing	Config 2		120 KHz
CSI-RS for RLM	Config 1, 2		Resource #4 in TRS.2.1
	<b>G</b> .		TDD
			Resource #4 in TRS.2.2
			TDD
TRS configuration			TRS.2.1 TDD
-			TRS.2.2 TDD
TCI configuration for P	DCCH#1/PDSCH		TCI.State.2
TCI configuration for P	DCCH#2		TCI.State.3
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and	Antenna Configuration		2x2 Low
1			
	DCI format		1-0
Out of sync	DCI format		1-0
Out of sync transmission	Number of Control OFDM		1-0 2
Out of sync	Number of Control OFDM symbols	CCF	2
Out of sync transmission	Number of Control OFDM symbols Aggregation level	CCE dB	
Out of sync transmission	Number of Control OFDM symbols Aggregation level Ratio of hypothetical PDCCH	CCE dB	2 8
Out of sync transmission	Number of Control OFDM symbols Aggregation level Ratio of hypothetical PDCCH RE energy to average CSI-		2 8
Out of sync transmission	Number of Control OFDM symbols Aggregation level Ratio of hypothetical PDCCH		2 8
Out of sync transmission	Number of Control OFDM symbols Aggregation level Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	2 8 4
Out of sync transmission	Number of Control OFDM symbols Aggregation level Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy  Ratio of hypothetical PDCCH		2 8
Out of sync transmission	Number of Control OFDM symbols Aggregation level Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy  Ratio of hypothetical PDCCH DMRS energy to average	dB	2 8 4
Out of sync transmission	Number of Control OFDM symbols Aggregation level Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy  Ratio of hypothetical PDCCH	dB	2 8 4
Out of sync transmission	Number of Control OFDM symbols Aggregation level Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy  Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	2 8 4
Out of sync transmission	Number of Control OFDM symbols Aggregation level Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy  Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy  DMRS precoder granularity	dB	8 4  REG bundle size
Out of sync transmission parameters	Number of Control OFDM symbols Aggregation level Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy  Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	2  8 4  4  REG bundle size 6
Out of sync transmission parameters  DRX	Number of Control OFDM symbols Aggregation level Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy  Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy  DMRS precoder granularity	dB	8 4  REG bundle size 6  OFF
Out of sync transmission parameters  DRX Gap pattern ID	Number of Control OFDM symbols Aggregation level Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy  Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy  DMRS precoder granularity	dB	8 4  REG bundle size 6  OFF  gp0
Out of sync transmission parameters  DRX	Number of Control OFDM symbols Aggregation level Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy  Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy  DMRS precoder granularity	dB	8 4  REG bundle size 6  OFF
Out of sync transmission parameters  DRX Gap pattern ID	Number of Control OFDM symbols Aggregation level Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy  Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy  DMRS precoder granularity	dB	8 4  REG bundle size 6  OFF  gp0
Out of sync transmission parameters  DRX Gap pattern ID Layer 3 filtering T310 timer T311 timer	Number of Control OFDM symbols Aggregation level Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy  Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy  DMRS precoder granularity	dB dB	8 4  REG bundle size  6  OFF  gp0  Enabled
Out of sync transmission parameters  DRX Gap pattern ID Layer 3 filtering T310 timer	Number of Control OFDM symbols Aggregation level Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy  Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy  DMRS precoder granularity	dB dB	8 4  REG bundle size  6  OFF  gp0  Enabled  0
Out of sync transmission parameters  DRX Gap pattern ID Layer 3 filtering T310 timer T311 timer N310 N311	Number of Control OFDM symbols Aggregation level Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy  Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy  DMRS precoder granularity REG bundle size	dB dB	2  8 4  4  REG bundle size  6  OFF  gp0  Enabled  0  1000  1
Out of sync transmission parameters  DRX Gap pattern ID Layer 3 filtering T310 timer T311 timer N310 N311 CSI-RS for CSI	Number of Control OFDM symbols Aggregation level Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy  Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy  DMRS precoder granularity REG bundle size  Config 1	dB dB	2  8 4  4  REG bundle size  6  OFF  gp0  Enabled  0  1000  1  1  CSI-RS.3.1 TDD
Out of sync transmission parameters  DRX Gap pattern ID Layer 3 filtering T310 timer T311 timer N310 N311 CSI-RS for CSI reporting	Number of Control OFDM symbols Aggregation level Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy  Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy  DMRS precoder granularity REG bundle size	dB dB	2  8 4  4  REG bundle size  6  OFF  gp0  Enabled  0  1000  1  1  CSI-RS.3.1 TDD  CSI-RS.3.1 TDD
Out of sync transmission parameters  DRX Gap pattern ID Layer 3 filtering T310 timer T311 timer N310 N311 CSI-RS for CSI reporting T1	Number of Control OFDM symbols Aggregation level Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy  Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy  DMRS precoder granularity REG bundle size  Config 1	dB dB	2  8 4  4  REG bundle size  6  OFF  gp0  Enabled  0  1000  1  1  CSI-RS.3.1 TDD
Out of sync transmission parameters  DRX Gap pattern ID Layer 3 filtering T310 timer T311 timer N310 N311 CSI-RS for CSI reporting T1 T2	Number of Control OFDM symbols Aggregation level Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy  Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy  DMRS precoder granularity REG bundle size  Config 1	dB dB	2  8 4  4  REG bundle size  6  OFF  gp0  Enabled  0  1000  1  1  CSI-RS.3.1 TDD  CSI-RS.3.1 TDD  0.2  0.35
Out of sync transmission parameters  DRX Gap pattern ID Layer 3 filtering T310 timer T311 timer N310 N311 CSI-RS for CSI reporting T1 T2 T3	Number of Control OFDM symbols Aggregation level Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy  Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy  DMRS precoder granularity REG bundle size  Config 1	dB  dB  ms ms	2  8 4  4  REG bundle size  6  OFF  gp0  Enabled  0  1000  1  1  CSI-RS.3.1 TDD  CSI-RS.3.1 TDD  CSI-RS.3.1 TDD  0.2  0.35  0.35
Out of sync transmission parameters  DRX Gap pattern ID Layer 3 filtering T310 timer T311 timer N310 N311 CSI-RS for CSI reporting T1 T2 T3 D1	Number of Control OFDM symbols Aggregation level Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy  Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy  DMRS precoder granularity REG bundle size  Config 1	dB  dB  ms  ms  s  s  s  s	2  8 4  4  REG bundle size  6  OFF  gp0  Enabled  0  1000  1  1  CSI-RS.3.1 TDD  CSI-RS.3.1 TDD  0.2  0.35

Note 2: E-UTRAN is in non-DRX mode under test.

Table A.5.5.1.5.1-3: Cell specific test parameters for FR2 for CSI-RS out-of-sync radio link monitoring in non-DRX mode

Para	meter	Unit		Test 1		
			T1 T2 T3			
PDCCH_be	ta	dB	4			
PDCCH_DN	MRS_beta	dB		4		
PBCH_beta	1	dB				
PSS_beta		dB				
SSS_beta		dB		0		
PDSCH_be	ta	dB				
OCNG_beta	a	dB	]			
SNR on RLM-RS1	Config 1,2	dB	2	-6	-15	
SNR on RLM-RS2	Config 1,2		2	-14	-15	
SNR on other channels and signals	Config 1, 2	dB	2			
$N_{oc}$	Config 1 Config 2	dBm/15KHz	TBD			
Propagation	n condition			TDL-A 30ns 75Hz		

- Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
- Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
- Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
- Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
- Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.5.5.1.5.1-1.
- Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6.

Table A.5.5.1.5.1-3A: Measurement gap configuration for FR2 CSI-RS out-of-sync radio link monitoring in non-DRX mode

	Field		
	Field		
	gapOffset	0	
Note 1:	E-UTRAN PCell and PSCe synchronous and frame bo aligned. (Ensure that RLM partially overlapped with m gap)	oundary RS is	

Table A.5.5.1.5.1-4: Void

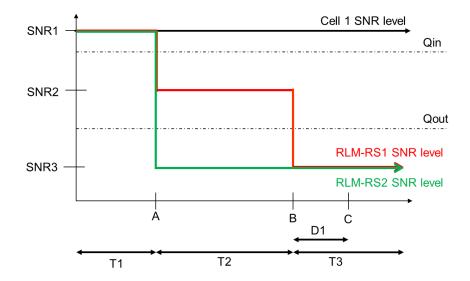


Figure A.5.5.1.5.1-1: SNR variation for CSI-RS out-of-sync testing

#### A.5.5.1.5.2 Test Requirements

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

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 2 (PSCell) at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 2.

The UE shall stop transmitting uplink signal in Cell 2 (PSCell) no later than time point C ( $D_1$  after the start of the time duration T3) on the PSCell.

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

## A.5.5.1.6 EN-DC Radio Link Monitoring In-sync Test for FR2 PSCell configured with CSI-RS-based RLM in non-DRX mode

#### A.5.5.1.6.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the in sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PSCell when no DRX is used. This test will partly verify the FR2 TDD PSCell CSI-RS In-sync radio link monitoring requirements in clause 8.1.

The test parameters are given in Tables A.5.5.1.6.1-1, A.5.5.1.6.1-2, and A.5.5.1.6.1-3 below. There are two cells, cell 1which is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.5.5.1.6.1-1 shows the variation of the downlink SNR in the PSCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. In the test, DRX configuration is not enabled. In the test, SSB0 and SSB1 are configured as BFD-RS.

Table A.5.5.1.6.1-1: Supported test configurations for FR2 PSCell

Configuration	tion Description	
1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode	
2 LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode		
Note: The UE is only required to pass in one of the supported test configurations in FR2		

Table A.5.5.1.6.1-2: General test parameters for FR2 PSCell for CSI-RS in-sync testing in non-DRX mode

Parameter		Unit	Value
			Test 1
Active E-UTRA PCell			Cell 1
E-UTRA RF Chan			1
Active PSCell			Cell 2
RF Channel Numl	ber		2
Duplex Mode			TDD
TDD	Config 1		TDDConf.3.1
Configuration	Config 2		TDDConf.3.1
DL initial BWP	Config 1, 2		DLBWP.0.1
configuration	, , _		
DL dedicated	Config 1, 2		DLBWP.1.1
BWP			
configuration			
UL initial BWP	Config 1, 2		ULBWP.0.1
configuration			
UL dedicated	Config 1, 2		ULBWP.1.1
BWP			
configuration			
RMC CORESET	Config 1		CCR.3.1 TDD
Reference			CCR.3.3 TDD
Channel	Config 2		CCR.3.1 TDD
			CCR.3.3 TDD
SSB	Config 1		SSB.1 FR2
Configuration	Config 2		SSB.1 FR2
SMTC	Config 1		SMTC.1
Configuration	Config 2		SMTC.1
PDSCH/PDCCH	Config 1		120 KHz
subcarrier spacing	Config 2		120 KHz
CSI-RS for RLM	Config 1, 2		Resource #4 in TRS.2.1 TDD
			Resource #4 in TRS.2.2 TDD
OCNG parameter			OP.1
TRS configuration	<u> </u>		TRS.2.1 TDD
_			TRS.2.2 TDD
TCI configuration for PDCCH#1/PDSCH			TCI.State.2
TCI configuration for PDCCH#2			TCI.State.3
CP length			Normal
Correlation Matrix and Antenna			2x2 Low
Configuration			
Out of sync	DCI format		1-0
transmission parameters	Number of Control		2
parameters	OFDM symbols Aggregation level	CCE	8
	Aggregation level	COE	0

	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
In sync	DCI format		1-0
transmission parameters	Number of Control OFDM symbols		2
	Aggregation level	CCE	4
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			OFF
Gap pattern ID			N.A.
Layer 3 filtering			Enabled
T310 timer		ms	1000
T311 timer		ms	1000
N310			1
N311			1
CSI-RS for CSI	Config 1		CSI-RS.3.1 TDD
reporting	Config 2		CSI-RS.3.1 TDD
T1		S	0.2
T2		S	0.2
T3		S	0.24
T4		S	0.2
T5		S	0.88
D1		S	0.84
	ecific PDCCH is not transmi		rts.
Note 2: E-UTRA	N is in non-DRX mode unde	er test.	

Table A.5.5.1.6.1-3: Cell specific test parameters for FR2 for CSI-RS in-sync radio link monitoring in non-DRX mode

Parameter		Unit			Test 1		
			T1	T2	Т3	T4	T5
PDCCH_beta		dB	4				
PDCCH_DMR	S_beta	dB			4		
PBCH_beta		dB					
PSS_beta		dB					
SSS_beta		dB			0		
PDSCH_beta		dB					
OCNG_beta		dB					
SNR on RLM-RS1	Config 1, 2	dB	2	-6	-15	-4.5	2
SNR on RLM-RS2	Config 1, 2	dB	2 -14 -15 -15 -14		-14		
SNR on other channels and signals Config 1, 2		dB	2				
$N_{oc}$	Config 1, 2	dBm/15KHz	TBD				
Propagation co	ndition			[T[	DL-A 30ns 75	Hz]	

- Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
- Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
- Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
- Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
- Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure A.5.5.1.6.1-1.
- Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6.

Table A.5.5.1.6.1-3A: Void

Table A.5.5.1.6.1-4: Void

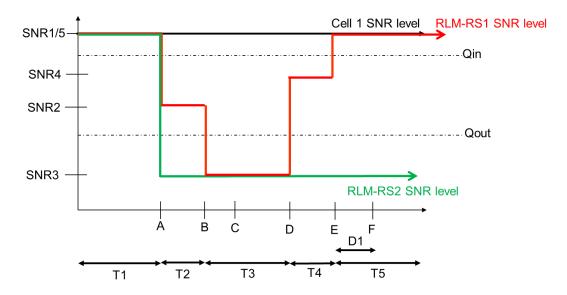


Figure A.5.5.1.6.1-1: SNR variation for CSI-RS in-sync testing

#### A.5.5.1.6.2 Test Requirements

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

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

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

## A.5.5.1.7 EN-DC Radio Link Monitoring Out-of-sync Test for FR2 PSCell configured with CSI-RS-based RLM in DRX mode

#### A.5.5.1.7.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PSCell when no DRX is used. This test will partly verify the FR2 TDD PSCell CSI-RS Out-of-sync radio link monitoring requirements in clause 8.1.

The test parameters are given in Tables A.5.5.1.7.1-1, A.5.5.1.7.1-2, and A.5.5.1.7.1-3 below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.5.5.1.7.1-1 shows the variation of the downlink SNR in the E-UTRAN PCell and the PSCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. In the test, DRX configuration is enabled in PSCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test. In the test, SSB0 and SSB1 are configured as BFD-RS.

Table A.5.5.1.7.1-1: Supported test configurations for FR2 PSCell

Configuration Description		Description
1 LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode		LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2	2 LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode	
Note: The UE is only required to pass in one of the supported test configurations in FR2		

Table A.5.5.1.7.1-2: General test parameters for FR2 PSCell for CSI-RS out-of-sync testing in DRX mode

Parameter	Unit	Value
		Test 1

E-UTRA RF Channel Number	Astine E LIEDA E	20-11		0-11.4
Active PSCell   Cell 2   Cell 2	Active E-UTRA PCell			Cell 1
RF Channel Number				-
Duplex Mode				
DD		nber		
Configuration   Config 2	_			
DL initial BWP   Config 1, 2		<u> </u>		
Diction   Config   Config		Config 2		TDDConf.3.1
Description   Config 1, 2	configuration	Config 1, 2		DLBWP.0.1
UL initial BWP	BWP	Config 1, 2		DLBWP.1.1
BWP	UL initial BWP configuration	Config 1, 2		ULBWP.0.1
RMC	BWP	Config 1, 2		ULBWP.1.1
Channel   Config 1	RMC	Config 1		CCR.3.3 TDD
Configuration         Config 2         SSB.1 FR2           SMTC         Config 1         SMTC.1           Config 2         SMTC.1         SMTC.1           PDSCH/PDCC H subcarrier spacing         Config 1         120 KHz           CSI-RS for RLM         Config 1, 2         Resource #4 in TRS.2.1 TDD Resource #4 in TRS.2.2 TDD           TRS configuration         TRS.2.1 TDD TRS.2.2 TDD         TCI configuration for PDCCH#1/PDSCH           TCI configuration for PDCCH#2 PDCCH#1/PDSCH         TCI.State.3           OCNG parameters         OP.1           CP length         Normal           Correlation Matrix and Antenna Configuration         2x2 Low           Out of sync transmission parameters         DCI format         1-0           Number of Control OPM symbols Aggregation level         2           Aggregation level Ratio of hypothetical PDCCH Re energy to average CSI-RS Re energy to Aver	Channel	-		CCR.3.3 TDD
SMTC				
Configuration   PDSCH/PDCC   H subcarrier   Short   Short	_			
PDSCH/PDCC   H subcarrier spacing   Config 1   Config 2   120 KHz	SMTC	Config 1		SMTC.1
PDSCH/PDCC   H subcarrier spacing   Config 1   Config 2   120 KHz	Configuration		1	
Config 2   120 KHz	-			
Spacing				
Config 1, 2   Resource #4 in TRS.2.1 TDD Resource #4 in TRS.2.1 TDD Resource #4 in TRS.2.2 TDD	spacing	Config 2		120 KHZ
TRS configuration   TRS.2.1 TDD   TRS.2.2 TDD	CSI-RS for	Config 1, 2		
TRS.2.2 TDD		n		
TCI configuration for PDCCH#1/PDSCH   TCI configuration for PDCCH#2   TCI.State.3				
TCI configuration for PDCCH#2				
OCNG parameters         OP.1           CP length         Normal           Correlation Matrix and Antenna         2x2 Low           Configuration         2x2 Low           Out of sync transmission parameters         DCI format         1-0           Number of Control OFDM symbols         2           Aggregation level Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy         dB         4           Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy         dB         4           DMRS precoder granularity         REG bundle size         REG bundle size           DRX         DRX.3         DRX.3           Gap pattern ID         N.A.         Enabled           T310 timer         ms         0				TCI Ctata 2
CP length         Normal           Correlation Matrix and Antenna         2x2 Low           Configuration         20           Out of sync transmission parameters         Number of Control OFDM symbols         2           Aggregation level         CCE         8           Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy         dB         4           Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy         dB         4           DMRS precoder granularity         REG bundle size         REG bundle size           DRX         DRX.3         DRX.3           Gap pattern ID         N.A.         Enabled           T310 timer         ms         0				
Correlation Matrix and Antenna	•	ers		
Configuration         Out of sync transmission parameters         DCI format         1-0           Number of Control OFDM symbols         2         2           Aggregation level Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy         dB         4           Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy         dB         4           DMRS precoder granularity         REG bundle size         REG bundle size           DRX         DRX.3         DRX.3           Gap pattern ID Layer 3 filtering         ms         0				
Out of sync transmission parameters         DCI format         1-0           Number of Control OFDM symbols         2           Aggregation level Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy         dB         4           Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy to average CSI-RS RE energy         REG bundle size           DMRS precoder granularity REG bundle size         6           DRX         DRX.3           Gap pattern ID Layer 3 filtering         Enabled           T310 timer         ms         0	_	x and Antenna		2x2 Low
transmission parameters         Number of Control OFDM symbols         2           Aggregation level Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy         dB         4           Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy         dB         4           DMRS precoder granularity REG bundle size         REG bundle size         REG bundle size           DRX         DRX.3           Gap pattern ID         N.A.           Layer 3 filtering         Enabled           T310 timer         ms         0		DOL 6		1.0
Aggregation level   CCE	transmission	Number of Control		
Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	parameters		005	
PDCCH RE energy to average CSI-RS RE energy				
PDCCH DMRS   energy to average   CSI-RS RE energy		PDCCH RE energy to average CSI-RS RE	aR	4
DMRS precoder granularity   REG bundle size   6		PDCCH DMRS energy to average	dB	4
DRX         DRX.3           Gap pattern ID         N.A.           Layer 3 filtering         Enabled           T310 timer         ms         0		DMRS precoder granularity		
Gap pattern ID         N.A.           Layer 3 filtering         Enabled           T310 timer         ms         0				
Layer 3 filtering Enabled T310 timer ms 0				
T310 timer ms 0				
	Layer 3 filtering			
T244 times		T310 timer		_
1311 uniei   ms 1000	T311 timer		ms	1000

N310			1
N311			1
CSI-RS for	Config 1		CSI-RS.3.1 TDD
CSI reporting	Config 2		CSI-RS.3.1 TDD
T1		S	0.2
T2		S	1.28
T3		S	1.28
D1		S	1.24
Note 1: UE-specific PDCCH is not transmitted after T1 starts.			starts.
Note 2: E-UTRAN is in non-DRX mode under test.			

Table A.5.5.1.7.1-3: Cell specific test parameters for FR2 for CSI-RS out-of-sync radio link monitoring in DRX mode

Parameter		Unit		Test 1	
			T1	T2	T3
PDCCH_beta		dB	4		
PDCCH_DMRS	S_beta	dB		4	
PBCH_beta		dB			
PSS_beta		dB			
SSS_beta		dB		0	
PDSCH_beta		dB			
OCNG_beta		dB			
SNR on RLM- RS1	Config 1, 2	dB	2	-6	-15
SNR on RLM- RS2	Config 1, 2		2	-14	-15
SNR on other channels and signals		dB	2		
N Config 1		dBm/15KHz	-104.7		
$N_{oc}$	Config 2			-104.7	
Propagation condition			DL-A 30ns 75Hz		<u></u>

- Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
- Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
- Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
- Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
- Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.5.5.1.7.1-1.
- Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6.

Table A.5.5.1.7.1-3A: Void

Table A.5.5.1.7.1-4: Void

Table A.5.5.1.7.1-5: Void

Table A.5.5.1.7.1-6: Void

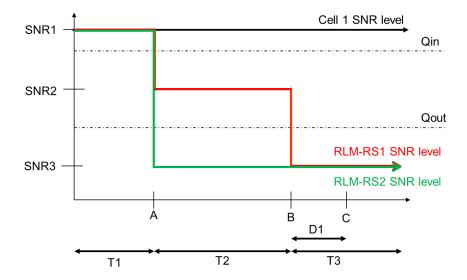


Figure A.5.5.1.7.1-1: SNR variation for CSI-RS out-of-sync testing

#### A.5.5.1.7.2 Test Requirements

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

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 2 (PSCell) at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 2.

The UE shall stop transmitting uplink signal in Cell 2 (PSCell) no later than time point C ( $D_1$  after the start of the time duration T3) on the PSCell.

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

## A.5.5.1.8 EN-DC Radio Link Monitoring In-sync Test for FR2 PSCell configured with CSI-RS-based RLM in DRX mode

#### A.5.5.1.8.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the in sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PSCell when no DRX is used. This test will partly verify the FR2 TDD PSCell CSI-RS In-sync radio link monitoring requirements in clause 8.1.

The test parameters are given in Tables A.5.5.1.8.1-1, A.5.5.1.8.1-2, A.5.5.1.8.1-3 and A.5.5.1.8.1-3A below. There are two cells, cell 1which is the E-UTRAN PCell, and cell 2 is the NR PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.5.5.1.8.1-1 shows the variation of the downlink SNR in the PSCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms).

Table A.5.5.1.8.1-1: Supported test configurations for FR2 PSCell

Configuration	tion Description	
1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode	
2 LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode		
Note: The UE is only required to pass in one of the supported test configurations in FR2		

Table A.5.5.1.8.1-2: General test parameters for FR2 PSCell for CSI-RS in-sync testing in non-DRX mode

Parameter		Unit	Value	
			Test 1	
Active E-UTRA PCell			Cell 1	
E-UTRA RF C	hannel Number		1	
Active PSCell			Cell 2	
RF Channel N	umber		2	
Duplex Mode			TDD	
TDD	Config 1		TDDConf.3.1	
Configuratio n	Config 2		TDDConf.3.1	
DL initial BWP configuration	Config 1, 2		DLBWP.0.1	
DL dedicated BWP configuration	Config 1, 2		DLBWP.1.1	
UL initial BWP configuration	Config 1, 2		ULBWP.0.1	
UL dedicated BWP	Config 1, 2		ULBWP.1.1	
configuration			007.04.777	
RMCCORES	Config 1		CCR.3.1 TDD	
ET Reference	0		CCR.3.3 TDD	
Channel	Config 2		CCR.3.1 TDD	
SSB	Config 1		CCR.3.3 TDD SSB.1 FR2	
Configuratio	Config 2		SSB.1 FR2	
n	Cornig 2		55B.1 FR2	
SMTC	Config 1		SMTC.1	
Configuratio n	Config 2		SMTC.1	
PDSCH/PD	Config 1		120 KHz	
CCH subcarrier spacing	Config 2		120 KHz	
CSI-RS for	Config 1, 2		Resource #4 in TRS.2.1 TDD	
RLM	Coming 1, 2		Resource #4 in TRS.2.1 TDD Resource #4 in TRS.2.2 TDD	
TRS configuration			TRS.2.1 TDD	
somgardion			TRS.2.2 TDD	
TCI configurat	ion for PDCCH#1/PDSCH		TCI.State.2	
TCI configurat	ion for PDCCH#2		TCI.State.3	
OCNG parame	eters		OP.1	
CP length			Normal	

	atrix and Antenna		2x2 Low
Configuration			
Out of sync	DCI format		1-0
transmission parameters	Number of Control OFDM symbols		2
•	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
In sync	DCI format		1-0
transmission parameters	Number of Control OFDM symbols		2
•	Aggregation level	CCE	4
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			DRX.3
Gap pattern II	)		gp0
Layer 3 filterin	g		Enabled
T310 timer		ms	2000
T311 timer		ms	1000
N310			1
N311			1
CSI-RS for	Config 1		CSI-RS.3.1 TDD
CSI	Config 2	Γ	CSI-RS.3.1 TDD
reporting			
T1		S	0.2
T2		S	0.2
Т3		S	1.64
T4		S	0.2
T5		S	1.88
D1		S	1.84
	-specific PDCCH is not transmi		
Note 2: F-UT	RAN is in non-DRX mode unde	er test	

Note 2: E-UTRAN is in non-DRX mode under test.

Table A.5.5.1.8.1-3: Cell specific test parameters for FR2 for CSI-RS in-sync radio link monitoring in DRX mode

Parameter		Unit			Test 1			
			T1	T2	T3	T4	T5	
PDCCH_beta		dB	4					
PDCCH_DMRS	S_beta	dB	4					
PBCH_beta		dB						
PSS_beta		dB						
SSS_beta		dB			0			
PDSCH_beta		dB						
OCNG_beta	OCNG beta		]					
SNR on RLM-RS1	Config 1, 2	dB	2	-6	-15	-4.5	2	
SNR on RLM-RS2	Config 1, 2	dB	2	-14	-15	-15	-14	
SNR on other channels and signals		dB	2					
$N_{oc}$	Config 1, 2	dBm/15KHz	-104.7					
Propagation condition			[TDL-A 30ns 75Hz]					

- Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
- Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
- Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
- Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
- Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure A.5.5.1.8.1-1.
- Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6.

Table A.5.5.1.8.1-3A: Measurement gap configuration for FR2 CSI-RS in-sync radio link monitoring in DRX mode

	Field	Test 1		
	Field			
	gapOffset	0		
Note 1:	E-UTRAN PCell and PSCe synchronous and frame bo aligned. (Ensure that RLM partially overlapped with m gap)	oundary RS is		

Table A.5.5.1.8.1-4: Void Table A.5.5.1.8.1-5: Void

Table A.5.5.1.8.1-6: Void

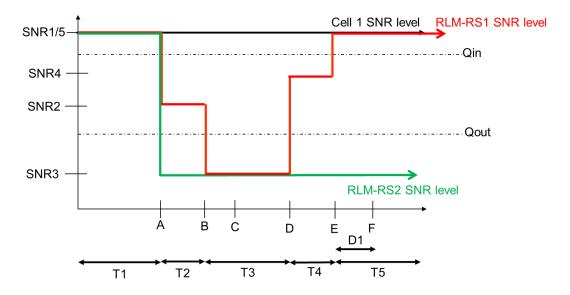


Figure A.5.5.1.8.1-1: SNR variation for CSI-RS in-sync testing

#### A.5.5.1.8.2 Test Requirements

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

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

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

#### A.5.5.1.9 EN-DC Radio Link Monitoring UE Scheduling Restrictions on FR2

#### A.5.5.1.9.1 Test Purpose and Environment

The purpose is to verify that the NR UE correctly follows the RLM scheduling restrictions requirements defined in clause 8.1.7. This test verifies that the UE correctly receive the PDCCH scheduled on the symbols right before the RLM SSB symbols without overlap so that it sends ACK/NACK correctly. The test case is only applicable to UE which supports pdcch-MonitoringAnyOccasions or pdcch-MonitoringAnyOccasionsWithSpanGap.

Two cells are deployed in the test, which are E-UTRAN PCell (Cell 1) and NR FR2 PSCell (Cell 2). The test parameters for NR PSCell are given in table A.5.5.1.9.1-1, table A.5.5.1.9.1-2 and table A.5.5.1.9.1-3 below and the parameters and applicability for the E-UTRAN cell are defined in A.3.7.2. The UE is required during time period T1 to transmit ACK/NACK correctly upon scheduling of PDSCH.

Table A.5.5.1.9.1-1: Supported test configurations

Configuration	on Description		
1	FDD LTE, 120 kHz SSB SCS, 120 kHz RMC SCS, 100 MHz bandwidth, TDD duplex		
	mode		
2	TDD LTE, 120 kHz SSB SCS, 120 kHz RMC SCS, 100 MHz bandwidth, TDD duplex		
	mode		
Note: The UE	te: The UE is only required to be tested in one of the supported test configurations.		

Table A.5.5.1.9.1-2: General test parameters for RLM scheduling restriction test case in FR2

Parameter	Unit	Test configuration	Value	Comment
RF Channel Number		1, 2	1 and 2	1 for NR PSCell and 2 for LTE PCell
SSB configuration		1, 2	SSB.1 FR2	
SMTC configuration		1, 2	SMTC	
			pattern 1	
DRX cycle length	S	1, 2	OFF	
T1	s	1, 2	5	During T1 the UE is required to correctly transmit ACK/NACK

Table A.5.5.1.9.1-3: Cell specific test parameters for RLM scheduling restriction test case in FR2

Parameter	Unit	Test	Cell 2	
		configuration	AoA1	AoA2
TDD configuration		1, 2	TDDC	onf.3.1
PDSCH RMC		1, 2	SR.3.1 TDD	Not sent
configuration				
RMSI CORESET		1, 2	CR.3.1	Not sent
RMC configuration				
Dedicated CORESET		1, 2	CCR.3.2	Not sent
RMC configuration				
TRS configuration		1, 2 1, 2	TRS.2.1 TDD	TRS.2.2 TDD
PDCCH/PDSCH TCI		1, 2	TCI.State.2	Not sent
state				
OCNG Pattern		1, 2	OP.1 defined in	Not sent
			A.3.2.1	
Initial DL BWP		1, 2	DLBV	VP.0.1
configuration				
Initial UL BWP		1, 2	ULBWP.0.1	
configuration				
RLM-RS		1, 2	SSB with index	SSB with index
			0	1
AoA setup		1, 2 1, 2	Setup 3 defin	ed in A.3.15.3
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	1, 2	3	N/A
	dBm/SCS	1, 2	-84.9	Not sent
$N_{oc}$ Note2	dbiii/303	1, 2	-04.9	Not sent
$\hat{E}_s/N_{oc}$	dB	1, 2	3	N/A
SS-RSRP Note3	dBm/SCS	1, 2	-81.9	-81.9
lo	dBm/95.04 MHz	1, 2	-51.15	-52.91
Propagation		1, 2		/GN
Condition				

#### A.5.5.1.9.2 Test Requirements

The UE behaviour follows the requirements defined in clause 8.1.7.3.

### A.5.5.2 Interruption

# A.5.5.2.1 E-UTRAN – NR FR2 interruptions at transitions between active and non-active during DRX in synchronous EN-DC

#### A.5.5.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that when E-UTRA PCell is in DRX and NR PSCell is in non-DRX, NR PSCell interruptions due to transitions from active to non-active and from non-active to active during LTE PCell DRX the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for NR PSCell in EN-DC specified in clause 8. 2.1.2. Supported test configurations are shown in table A.5.5.2.1.1-1.

The general test parameters are given in Table A.5.5.2.1.1-2, and NR cell specific test parameters are given in Table A.5.5.2.1.1-3 and A.5.5.2.1.1-4. The E-UTRAN PCell DRX configuration parameters are given in Table A.5.5.2.1.1-5 below. And the E-UTRAN cell specific test parameters can refer to Table A.3.7.2.2-1. In the test there are two cells: Cell1 and Cell2. Cell1 is LTE PCell on and Cell2 is NR FR2 PSCell. The test consists of one time period, with duration of T1. During T1, NR PSCell is continuously scheduled in DL while LTE PCell is not scheduled and has DRX configured. Prior to the start of the time duration T1, Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. Prior to start of T1 the DRX inactivity timer for the LTE PCell has already expired. During T1 the UE shall be continuously scheduled on NR PSCell while not scheduled on LTE PCell. PDCCH indicating a new transmission on PSCell shall be sent continuously during the entire time duration to ensure UE would not enter DRX state on PSCell.

Table A.5.5.2.1.1-1: Interruption at transitions between active and non-active during DRX supported test configurations

Config	Description
1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Table A.5.5.2.1.1-2: General test parameters for E-UTRAN – NR FR2 interruptions at transitions between active and non-active during DRX in synchronous EN-DC

Parameter	Unit	Value	Comment
RF Channel Number		1, 2	One is E-UTRAN RF channel and the
		Ι, Ζ	other is NR RF channel
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Configured PSCell		Cell2	PSCell on NR RF channel number 2.
CP length		Normal	Applicable to cell1 and cell 2
DRX		DRX.4	DRX related parameters are defined in Table A.3.3.4-1
Measurement gap pattern Id		OFF	
T1	S	10	

Table A.5.5.2.1.1-3: NR cell specific test parameters for E-UTRAN – NR FR2 interruptions at transitions between active and non-active during DRX in synchronous EN-DC

Parameter		Unit	Cell 2
Frequency Range			FR2
Duplex mode	Config 1,2		TDD
TDD configuration	Config 1,2		TDDConf.3.1
BW <sub>channel</sub>	Config 1,2	MHz	100: N <sub>RB,c</sub> = 66
Downlink initial BWP Configuration	Config 1,2		DLBWP.0.1
Downlink dedicated BWP Configuration	Config 1,2		DLBWP.1.1
Uplink initial BWP configuration	Config 1,2		ULBWP.0.1
Uplink dedicated BWP configuration	Config 1,2		ULBWP.1.1
TRS configuration	Config 1,2		TRS.2.1 TDD
TCI state	Config 1,2		TCI.State.0
PDSCH Reference measurement channel	Config 1,2		SR.3.1 TDD
RMSI CORESET Reference Channel	Config 1,2		CR.3.1 TDD
RMC CORESET Reference Channel	Config 1,2		CCR.3.1 TDD
OCNG Patterns			OP.1
SSB Configuration			SSB.1 FR2
SMTC Configuration	Config 1,2		SMTC.1
EPRE ratio of PSS to SSS  EPRE ratio of PBCH DMRS to SSS  EPRE ratio of PBCH to PBCH DMRS  EPRE ratio of PDCCH DMRS to SSS  EPRE ratio of PDCCH to PDCCH DMRS		dB	0
EPRE ratio of PDSCH DMRS to SSS EPRE ratio of PDSCH to PDSCH EPRE ratio of OCNG DMRS to SSS(Note 1)			v
EPRE ratio of OCNG to OCNG DMRS (Note 1) Ês/Noc		dB	17
Propagation Condition			AWGN
Time offset to cell1 Note 2		μS	3
Nete 4: OONO electib			

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

Note 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells

Table A.5.5.2.1.1-4: NR cell specific OTA related test parameters for E-UTRAN – NR FR2 interruptions at transitions between active and non-active during DRX in synchronous EN-DC

	Parameter	Unit	Cell2	
Angle of	arrival configuration		According to clause A.3.15.1	
$N_{oc}$ Note1		dBm/15kHz <sup>Note4</sup>	-112	
$N_{oc}$ Note1		dBm/SCS <sup>Note3</sup>	-102.97	
$\hat{E}_s/N_{ob}$	с	dB	17	
SS-RSRP <sup>Note2</sup>		dBm/SCS Note4	-85.97	
$\hat{\mathrm{E}}_{_{\mathrm{s}}}/\mathrm{I}_{_{\mathrm{ot}}}$		dB	17	
Io <sup>Note2</sup>		dBm/95.04 MHz Note4	-56.90	
Note 1:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{ac}$ to be fulfilled.			
Note 2:	2: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.			
Note 3:	SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.			
Note 4: Note 5:	Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone As observed with 0dBi gain antenna at the centre of the quiet zone			

Table A.5.5.2.1.1-5: Void

### A.5.5.2.1.2 Test Requirements

The UE shall be continuously scheduled in NR PSCell during the entire length of T1. UE shall not be scheduled in LTE PCell during T1. During the time duration T1 the UE shall transmit at least 99% of ACK/NACK on NR PSCell.

Interruption on NR PSCell shall not exceed 0.625ms (5 slots) as defined in clause 8. 2.1.

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

# A.5.5.2.2 E-UTRAN – NR FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC

#### A.5.5.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that when LTE PCell is in DRX and NR PSCell is in non-DRX, NR PSCell interruptions due to transitions from active to non-active and from non-active to active during LTE PCell DRX the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for NR PSCell in EN-DC specified in clause 8. 2.1.2. Supported test configurations are shown in table A.5.5.2.2.1-1.

The general test parameters are given in Table A.5.5.2.2.1-2, and NR cell specific test parameters are given in Table A.5.5.2.2.1-3 and A.5.5.2.2.1-4. The E-UTRAN PCell DRX configuration parameters are given in Table A.5.5.2.2.1-5 below. And the E-UTRAN cell specific test parameters can refer to Table A.3.7.2.2-1. In the test there are two cells: Cell1 and Cell2. Cell1 is LTE PCell and Cell2 is NR PSCell. The test consists of one time period, with duration of T1. During T1, NR PSCell is continuously scheduled in DL while LTE PCell is not scheduled and has DRX configured. Prior to the start of the time duration T1, Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. Prior to start of T1 the DRX inactivity timer for the LTE PCell has already expired. During T1 the UE shall be continuously scheduled on NR PSCell while not scheduled on LTE PCell. PDCCH

indicating a new transmission on PSCell shall be sent continuously during the entire time duration to ensure UE would not enter DRX state on PSCell.

Table A.5.5.2.2.1-1: Interruption at transitions between active and non-active during DRX supported test configurations

Config	Description
1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only	required to be tested in one of the supported test configurations

Table A.5.5.2.2.1-2: General test parameters for E-UTRAN – NR FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC

Parameter	Unit	Value	Comment
RF Channel Number		1, 2	One is E-UTRAN RF channel and the
		1, 2	other is NR RF channel
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Configured PSCell		Cell2	PSCell on NR RF channel number 2.
CP length		Normal	Applicable to cell1 and cell 2
DRX		DRX.6	DRX related parameters are defined in
		DRA.0	Table A.3.3.6-1
Measurement gap pattern		OFF	
Id		OFF	
T1	S	10	

Table A.5.5.2.2.1-3: NR cell specific test parameters for E-UTRAN – NR FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC

Parame	ter	Unit	Cell 2
Frequency Range	Frequency Range		FR2
Duplex mode	Config 1,2		TDD
TDD configuration	Config 1,2		TDDConf.3.1
BW <sub>channel</sub>	Config 1,2	MHz	100: N <sub>RB.c</sub> = 66
Downlink initial BWP			DI DIVID O 4
Configuration	Config 1,2		DLBWP.0.1
Downlink dedicated	Config 1,2		DLBWP.1.1
BWP Configuration	Cornig 1,2		DLDWP.I.I
Uplink initial BWP	Config 1,2		ULBWP.0.1
configuration	Coming 1,2		02BW1 .0.1
Uplink dedicated BWP configuration	Config 1,2		ULBWP.1.1
TRS configuration	Config 1,2		TRS.2.1 TDD
TCI state	Config 1,2		TCI.State.0
PDSCH Reference	Config 1,2		SR.3.1 TDD
measurement channel	Corning 1,2		3N.3.1 1DD
RMSI CORESET	Config 1,2		CR.3.1 TDD
Reference Channel	Corning 1,2		ON.3.1 1DD
RMC CORESET	Config 1,2		CCR.3.1 TDD
Reference Channel	Coming 1,2		
OCNG Patterns			OP.1
SSB Configuration			SSB.1 FR2
SMTC Configuration	Config 1,2		SMTC.1
EPRE ratio of PSS to SSS		dB	
EPRE ratio of PBCH DMRS			
EPRE ratio of PBCH to PBC			
EPRE ratio of PDCCH DMF			•
	EPRE ratio of PDCCH to PDCCH DMRS		0
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH  EPPE ratio of OCNG DMPS to SSS(Note 1)			
EPRE ratio of OCNG DMRS to SSS(Note 1) EPRE ratio of OCNG to OCNG DMRS (Note 1)			
Ê <sub>s</sub> /N <sub>oc</sub>		dB	17
Es/INoc		ub	11
Propagation Condition			AWGN
Time offset to cell1 Note 2		ms	3
Nata 4. OONO aballib		l II £ - II	U 4 - d d 4 4 - 4

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

Note 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells

Table A.5.5.2.2.1-4: NR cell specific OTA related test parameters for E-UTRAN – NR FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC

	Parameter	Unit	Cell2
Angle of arrival configuration			According to clause A.3.15.1
$N_{oc}$ Note1		dBm/15kHz <sup>Note4</sup>	-112
$N_{oc}$ Note1		dBm/SCS <sup>Note3</sup>	-102.97
$\hat{E}_s/N_{od}$	2	dB	17
SS-RSRP <sup>Note2</sup>		dBm/SCS Note4	-85.97
$\hat{\mathrm{E}}_{_{\mathrm{s}}}/\mathrm{I}_{_{\mathrm{ot}}}$		dB	17
Io <sup>Note2</sup>		dBm/95.04 MHz Note4	-56.90
Note 1:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{ac}$ to be fulfilled.		
Note 2:	ote 2: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.		
Note 3:	SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.		
Note 4: Note 5:	Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone		

Table A.5.5.2.2.1-5: Void

# A.5.5.2.2.2 Test Requirements

The UE shall be continuously scheduled in NR PSCell during the entire length of T1. UE shall not be scheduled in LTE PCell during T1. During the time duration T1 the UE shall transmit at least 99% of ACK/NACK on NR PSCell.

Interruption on NR PSCell shall not exceed 0.625ms (5 slots) as defined in clause 8. 2.1.

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

# A.5.5.2.3 E-UTRAN – NR FR2 interruptions during measurements on deactivated NR SCC in synchronous EN-DC

### A.5.5.2.3.1 Test Purpose and Environment

The purpose of this test is to verify E-UTRAN PCell and NR PSCell interruptions during the measurement on the deactivated NR SCC, the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for E-UTRAN PCell and NR PSCell in EN-DC specified in clause 8. 2.1.2. Supported test configurations are shown in table A.5.5.2.3.1-1.

The general test parameters are given in Table A.5.5.2.3.1-2, and NR cell specific test parameters are given in Table A.5.5.2.3.1-3 and A.5.5.2.3.1-4 below. And the E-UTRAN cell specific test parameters can refer to Table A.3.7.2.1-2. In the test there are three cells: Cell1 Cell2 and Cell3. Cell1 is LTE PCell, Cell2 and Cell 3 is NR FR2 PSCell and NR FR2 deactivated SCell. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE is connected to Cell1 and Cell2. The point in time at which the RRC message including *measCycleSCell* for the deactivated NR SCells is received by the UE, defines the start of time period T1. During T1, LTE PCell and NR PSCell are continuously scheduled in DL.

Table A.5.5.2.3.1-1: Interruption during measurements on deactivated NR SCC supported test configurations

C	onfig	Description
	1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
	2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note:	The UE is only r	equired to be tested in one of the supported test configurations

Table A.5.5.2.3.1-2: General test parameters for E-UTRAN – NR FR2 interruptions during measurements on deactivated NR SCC in synchronous EN-DC

Parameter	Unit	Value	Comment
RF Channel Number		1.2	One is E-UTRAN RF channel and the
		1, 2	other two are NR RF channel
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Configured PSCell		Cell2	PSCell on NR RF channel number 2.
Configured deactivated		Cell3	Deactivated SCell on NR RF channel
SCell			number 2.
CP length		Normal	Applicable to cell1, cell 2 and cell3
DRX		OFF	
Measurement gap pattern		OFF	
Id		OFF	
SCell measurement cycle	Ms	640	
(measCycleSCell)	IVIS	040	
T1	S	10	

Table A.5.5.2.3.1-3: NR cell specific test parameters for E-UTRAN – NR FR2 interruptions during measurements on deactivated NR SCC in synchronous EN-DC

Parameter		Unit	Cell 2	Cell 3
Frequency Range			FR2	FR2
Duplex mode	Config 1,2		TDD	TDD
TDD configuration	Config 1,2		TDDConf.3.1	TDDConf.3.1
BW <sub>channel</sub>	Config 1,2	MHz	100: N <sub>RB,c</sub> = 66	100: N <sub>RB,c</sub> = 66
Downlink initial BWP		IVII IZ		
Configuration	Config 1,2		DLBWP.0.1	DLBWP.0.1
Downlink dedicated BWP Configuration	Config 1,2		DLBWP.1.1	DLBWP.1.1
Uplink initial BWP configuration	Config 1,2		ULBWP.0.1	ULBWP.0.1
Uplink dedicated BWP configuration	Config 1,2		ULBWP.1.1	ULBWP.1.1
PDSCH Reference measurement channel	Config 1,2		SR.3.1 TDD	-
RMSI CORESET Reference Channel	Config 1,2		CR.3.1 TDD	CR.3.1 TDD
PDCCH CORESET	Config 1,2		CCR 3.1 TDD	CCR 3.1 TDD
parameters OCNG Patterns			OP.1	OP.1
SSB Configuration	Config 1,2		SSB.1 FR2	SSB.1 FR2
SMTC Configuration	Config 1,2		SMTC.1	SMTC.1
TRS configuration	Config 1,2		TRS.2.1 TDD	TRS.2.1 TDD
TCI state	Config 1,2		TCI.State.0	TCI.State.0
EPRE ratio of PSS to SSS				
EPRE ratio of PBCH DMRS	S to SSS	1		
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS		dB	0	0
EPRE ratio of PDSCH DMRS to SSS		]		
EPRE ratio of PDSCH to PDSCH		]		
EPRE ratio of OCNG DMRS to SSS(Note 1)		1		
EPRE ratio of OCNG to OCNG DMRS (Note 1)			A1A/OA1	AVACAL
Propagation Condition			AWGN	AWGN
Time offset to cell1 Note 2		μS	3	3
Time offset to cell1 Note 3		μS	-	3

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

Table A.5.5.2.3.1-4: NR cell specific OTA related test parameters for E-UTRAN – NR FR2 interruptions during measurements on deactivated NR SCC in synchronous EN-DC

Parameter		Unit	Cell 2	Cell 3
Angle of arrival configuration			Setup 1 defined in clause A.3.15.1	Setup 1 defined in clause A.3.15.1
NR_TDD_FR2_A		dBm/15kHz	-112	-105
NR_TDD_FR2_B		UDIII/ IOKHZ	-112	-105

Note 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells

Note 3: Receive time difference of signals received between slot timing boundary from two NR Cells including time alignment error between the two cells

	NR TDD FR2 F			
$N_{oc}^{ m Note1}$	NR_TDD_FR2_G			
	NR_TDD_FR2_T			
	NR_TDD_FR2_Y			
	NR_TDD_FR2_A			
	NR_TDD_FR2_B			
$N_{oc}^{ m Note1}$	NR_TDD_FR2_F	dBm/SCS <sup>Note</sup>	-103	-96
	NR_TDD_FR2_G	3	-103	-90
	NR_TDD_FR2_T			
	NR_TDD_FR2_Y			
	NR_TDD_FR2_A			
	NR_TDD_FR2_B			
SS-RSRP <sup>Note2</sup>	NR_TDD_FR2_F	dBm/SCS	-86	-86
00-110111	NR_TDD_FR2_G	Note4	-00	-00
	NR_TDD_FR2_T			
	NR_TDD_FR2_Y			
	NR_TDD_FR2_A			
	NR_TDD_FR2_B			
$\hat{E}_{s}/I_{ot}$	NR_TDD_FR2_F	dB	17	10
L <sub>s</sub> /L <sub>ot</sub>	NR_TDD_FR2_G	_	17	10
	NR_TDD_FR2_T			
	NR_TDD_FR2_Y			
	NR_TDD_FR2_A			
	NR_TDD_FR2_B			
$\hat{E}_s/N_{oc}$	NR_TDD_FR2_F	dB	17	10
125/1400	NR_TDD_FR2_G	_	17	10
	NR_TDD_FR2_T			
	NR_TDD_FR2_Y			
	NR_TDD_FR2_A			
	NR_TDD_FR2_B	<u> </u>		
Io <sup>Note2</sup>	NR_TDD_FR2_F	dBm/95.04	-59.4	-59.4
	NR_TDD_FR2_G	MHz Note4	-00.4	00.1
	NR_TDD_FR2_T	1		
N. 4 . 1 . 5	NR_TDD_FR2_Y	<u> </u>		
Note 1: Interferen	ce from other cells and	noise sources no	nt specified in the tes	t is assitimed to he

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 2: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone

Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone

# A.5.5.2.3.2 Test Requirements

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed the value defined in Table A.5.5.2.3.2-1 and Table A.5.5.2.3.2-2.

Table A.5.5.2.3.2-1: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length (slot)
3	0.125	4

Table A.5.5.2.3.2-2: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length (slot)
3	0.125	4 + SMTC duration

Each interruption on E-UTRAN PCell shall not exceed 1 subframe for synchronous interband EN-DC.

Each interruption on E-UTRAN PCell shall not exceed 1 subframe.

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

# A.5.5.2.4 E-UTRAN – NR FR2 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

# A.5.5.2.4.1 Test Purpose and Environment

The purpose of this test is to verify E-UTRAN PCell and NR PSCell interruptions during the measurement on the deactivated NR SCC, the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for E-UTRAN PCell and NR PSCell in EN-DC specified in clause 8. 2.1.2. Supported test configurations are shown in table A.5.5.2.4.1-1.

The general test parameters are given in Table A.5.5.2.4.1-2, and NR cell specific test parameters are given in Table A.5.5.2.4.1-3 and A.5.5.2.4.1-4 below. And the E-UTRAN cell specific test parameters can refer to Table A.3.7.2.1-2. In the test there are three cells: Cell1 Cell2 and Cell3. Cell1 is LTE PCell, Cell2 and Cell 3 is NR FR2 PSCell and NR FR2 deactivated SCell. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE is connected to Cell1 and Cell2. The point in time at which the RRC message including *measCycleSCell* for the deactivated NR SCells is received by the UE, defines the start of time period T1. During T1, LTE PCell and NR PSCell are continuously scheduled in DL.

Table A.5.5.2.4.1-1: Interruption during measurements on deactivated NR SCC supported test configurations

	Config	Description
	1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
	2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations		

Table A.5.5.2.4.1-2: General test parameters for E-UTRAN – NR interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

Parameter	Unit	Value	Comment
RF Channel Number		1, 2	One is E-UTRAN RF channel and the other two are NR RF channel
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Configured PSCell		Cell2	PSCell on NR RF channel number 2.
Configured deactivated SCell		Cell3	Deactivated SCell on NR RF channel number 2.
CP length		Normal	Applicable to cell1, cell 2 and cell3
AoA number		1	Applicable to cell2 and cell3
DRX		OFF	
Measurement gap pattern Id		OFF	
SCell measurement cycle (measCycleSCell)	ms	640	
T1	S	10	

Table A.5.5.2.3.1-3: NR cell specific test parameters for E-UTRAN – NR interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

Paramete	r	Unit	Cell 2	Cell 3
Frequency Range			FR2	FR2
Duplex mode	Config 1,2		TDD	TDD
Duplex mode	Cornig 1,2		100	100
TDD	05-40		TDD0	TDD0
TDD configuration	Config 1,2	NALL-	TDDConf.3.1	TDDConf.3.1
BW <sub>channel</sub>	Config 1,2	MHz	100: N <sub>RB,c</sub> = 66	100: N <sub>RB,c</sub> = 66
Downlink initial BWP Configuration	Config 1,2		DLBWP.	0.1
Downlink dedicated BWP Configuration	Config 1,2		DLBWP.	1.1
Uplink initial BWP configuration	Config 1,2		ULBWP.	0.1
Uplink dedicated BWP configuration	Config 1,2		ULBWP.	1.1
PDSCH Reference measurement channel	Config 1,2		SR.3.1 TDD	-
RMSI CORESET Reference Channel	Config 1,2		CR.3.1 TDD	CR.3.1 TDD
PDCCH CORESET parameters	Config 1,2		CCR.3.1 TDD	CCR.3.1 TDD
OCNG Patterns			OP.1	OP.1
SSB Configuration			SSB.1 FR2	SSB.1 FR2
SMTC Configuration	Config 1,2		SMTC.1 FR2	SMTC.1 FR2
TRS configuration	Config 1,2		TRS.2.1 TDD	TRS.2.1 TDD
TCI state	Config 1,2		TCI.State.0	TCI.State.0
EPRE ratio of PSS to SSS EPRE ratio of PBCH DMRS to	<b>G</b> ,			
EPRE ratio of PBCH to PBCH				
EPRE ratio of PDCCH DMRS to SSS  EPRE ratio of PDCCH to PDCCH DMRS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH to PDSCH  EPRE ratio of OCNG DMRS to SSS(Note 1)				
		dB	0	0
			· ·	
		1		
EPRE ratio of OCNG to OCN	G DMRS (Note 1)			
Propagation Condition			AWGN	AWGN
Time offset to cell1 Note 2		ms	3	3
Time offset to cell1 Note 3		μS	_	3

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

Note 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells

Note 3: Receive time difference of signals received between slot timing boundary from two NR Cells including time alignment error between the two cells

Table A.5.5.2.4.1-4: NR cell specific OTA related test parameters for E-UTRAN – NR FR2 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

Parameter		Unit	Cell 2	Cell 3
Angle of arrival configuration			Setup 1 defined	Setup 1 defined
			in clause A.3.15.1	in clause A.3.15.1
	NR_TDD_FR2_A	dDm/1EkU=	110	105
	NR_TDD_FR2_B	dBm/15kHz	-112	-105

	NR_TDD_FR2_F				
$N_{oc}^{ m Note1}$	NR_TDD_FR2_G				
	NR_TDD_FR2_T				
	NR_TDD_FR2_Y				
	NR_TDD_FR2_A				
	NR_TDD_FR2_B				
$N_{oc}^{ m Note1}$	NR_TDD_FR2_F	dBm/SCS <sup>Note</sup>	-103	-96	
	NR_TDD_FR2_G	3	-103	-90	
	NR_TDD_FR2_T				
	NR_TDD_FR2_Y				
	NR_TDD_FR2_A				
	NR_TDD_FR2_B				
SS-RSRPNote	NR_TDD_FR2_F	dBm/SCS	-86	-86	
00-110111	NR_TDD_FR2_G	Note4	-00	-00	
	NR_TDD_FR2_T				
	NR_TDD_FR2_Y				
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$		dB	17	10	
Ê <sub>s</sub> /N <sub>oc</sub>		dB	17	10	
	NR_TDD_FR2_A				
	NR_TDD_FR2_B				
lo <sup>Note2</sup>	NR_TDD_FR2_F	dBm/95.04	-59.4	-59.4	
10	NR_TDD_FR2_G	MHz Note4	-53.4	-53.4	
	NR_TDD_FR2_T				
	NR_TDD_FR2_Y				
Note 1: Interference from other cells and noise sources not specified in the test is assumed to be					
	constant over subcarriers and time and shall be modelled as AWGN of appropriate power				
foi	for $N_{oc}$ to be fulfilled.				
Note 2: SS	Note 2: SS-RSRP and lo levels have been derived from other parameters for information				
	purposes. They are not settable parameters themselves.				
Note 3: SS	S-RSRP minimum requirements	SRP minimum requirements are specified assuming independent interference and			

# A.5.5.2.4.2 Test Requirements

Note 4:

Note 5:

noise at each receiver antenna port.

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed the value defined in Table A.5.5.2.4.2-1 and Table A.5.5.2.4.2-2.

As observed with 0dBi gain antenna at the centre of the guiet zone

Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone

Table A.5.5.2.4.2-1: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length (slot)
3	0.125	4

Table A.5.5.2.4.2-2: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length (slot)
3	0.125	4 + SMTC duration

Each interruption on E-UTRAN PCell shall not exceed 1 subframe.

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

# A.5.5.2.5 E-UTRAN – NR FR2 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC

# A.5.5.2.5.1 Test Purpose and Environment

The purpose of this test is to verify E-UTRAN PCell and NR PSCell interruptions during the measurement on the deactivated E-UTRAN SCC, the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for E-UTRAN PCell and NR PSCell in EN-DC specified in clause 8. 2.1.2. Supported test configurations are shown in table A.5.5.2.5.1-1.

The general test parameters are given in Table A.5.5.2.5.1-2, and NR cell specific test parameters are given in Table A.5.5.2.5.1-3 and A.5.5.2.5.1-4 below. And the E-UTRAN cell specific test parameters can refer to Table A.3.7.2.1-2. In the test there are three cells: Cell1 Cell2 and Cell3. Cell1 and Cell3 is LTE PCell and LTE deactivated SCell, Cell2 is NR FR2 PSCell. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE is connected to Cell1 and Cell2. The point in time at which the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated E-UTRA SCell is received by the UE, defines the start of time period T1. During T1, LTE PCell and NR PSCell are continuously scheduled in DL.

Table A.5.5.2.5.1-1: Interruption during measurements on deactivated E-UTRAN SCC supported test configurations

Config	Description
1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only r	equired to be tested in one of the supported test configurations

Table A.5.5.2.5.1-2: General test parameters for E-UTRAN – NR FR2 interruptions during measurements on deactivated E\_UTRAN SCC in synchronous EN-DC

Parameter	Unit	Value	Comment
RF Channel Number		1, 2	One is E-UTRAN RF channel and two is NR RF channel
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Configured PSCell		Cell2	PSCell on NR RF channel number 2.
Configured deactivated		Cell3	Deactivated SCell on E-UTRAN RF
SCell			channel number 1.
CP length		Normal	Applicable to cell1, cell 2 and cell3
DRX		OFF	
Measurement gap pattern Id		OFF	
SCell measurement cycle (measCycleSCell)	ms	640	
T1	S	10	·

Table A.5.5.2.5.1-3: NR cell specific test parameters for E-UTRAN – NR FR2 interruptions during measurements on deactivated E\_UTRAN SCC in synchronous EN-DC

Paramet	ter	Unit	Cell 2
Frequency Range			FR2
Duplex mode	Config 1,2		TDD
TDD configuration	Config 1,2		TDDConf.3.1
BW <sub>channel</sub>	Config 1,2	MHz	100: N <sub>RB,c</sub> = 66
Downlink initial BWP Configuration	Config 1,2		DLBWP.0.1
Downlink dedicated BWP Configuration	Config 1,2		DLBWP.1.1
Uplink initial BWP configuration	Config 1,2		ULBWP.0.1
Uplink dedicated BWP configuration	Config 1,2		ULBWP.1.1
PDSCH Reference measurement channel	Config 1,2		SR.3.1 TDD
RMSI CORESET Reference Channel	Config 1,2		CR.3.1 TDD
PDCCH CORESET parameters	Config 1,2		CCR.3.1 TDD
OCNG Patterns			OP.1
SMTC Configuration	Config 1,2		SMTC.1 FR2
SSB Configuration	Config 1,2		SSB.1 FR2
TRS configuration	Config 1,2		TRS.2.1 TDD
TCI state	Config 1,2		TCI.State.0
EPRE ratio of PSS to SSS EPRE ratio of PBCH DMRS	· ·	dB	
EPRE ratio of PBCH to PBC			
EPRE ratio of PDCCH DMR			
EPRE ratio of PDCCH to PDCCH DMRS			0
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
	EPRE ratio of OCNG DMRS to SSS(Note 1)		
EPRE ratio of OCNG to OC	NG DMRS (Note 1)		
Propagation Condition			AWGN
Time offset to cell1 Note 2		μs	3

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

Note 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells

Table A.5.5.2.5.1-4: NR cell specific OTA related test parameters for E-UTRAN – NR FR2 interruptions during measurements on deactivated E\_UTRAN SCC in synchronous EN-DC

	Parameter	Unit	Cell2
Angle of a	arrival configuration		Setup 1 according to clause A.3.15.1
$N_{oc}$ Note1		dBm/15kHz <sup>Note4</sup>	-112
$N_{oc}$ Note1		dBm/SCS <sup>Note3</sup>	-102.97
$\hat{E}_s/N_{oc}$	,	dB	17
SS-RSRF	Note2	dBm/SCS Note4	-85.97
$\hat{\mathrm{E}}_{_{\mathrm{s}}}/\mathrm{I}_{_{\mathrm{ot}}}$		dB	17
Io <sup>Note2</sup>		dBm/95.04 MHz Note4	-56.90
Note 1:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{ac}$ to be fulfilled.		
Note 2:			
Note 3:			
Note 4: Note 5:		ceived by an antenna with 0d Bi gain antenna at the centre	Bi gain at the centre of the quiet zone of the quiet zone

# A.5.5.2.5.2 Test Requirements

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed the value defined in Table A.5.5.2.5.2-1 and Table A.5.5.2.5.2-2.

Table A.5.5.2.5.2-1: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length (slot)
3	0.125	5

Table A.5.5.2.5.2-2: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length (slot)
3	0.125	4 + SMTC duration

Each interruption on E-UTRAN PCell shall not exceed 1 subframe if the PCell is not in the same band as the deactivated SCell, or 5 subframes if the PCell is in the same band as the deactivated SCell.

Each interruption on E-UTRAN PCell shall not exceed 1 subframe.

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

# A.5.5.2.6 E-UTRAN – NR FR2 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC

### A.5.5.2.6.1 Test Purpose and Environment

The purpose of this test is to verify E-UTRAN PCell and NR PSCell interruptions during the measurement on the deactivated E-UTRAN SCC, the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for E-UTRAN PCell and NR PSCell in EN-DC specified in clause 8. 2.1.2. Supported test configurations are shown in table A.5.5.2.6.1-1.

The general test parameters are given in Table A.5.5.2.6.1-2, and NR cell specific test parameters are given in Table A.5.5.2.6.1-3 and A.5.5.2.6.1-4 below. And the E-UTRAN cell specific test parameters can refer to Table A.3.7.2.1-2. In the test there are three cells: Cell1 Cell2 and Cell3. Cell1 and Cell3 is LTE PCell and LTE deactivated SCell, Cell2 is NR FR2 PSCell. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE is connected to Cell1 and Cell2. The point in time at which the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated E-UTRA SCell is received by the UE, defines the start of time period T1. During T1, LTE PCell and NR PSCell are continuously scheduled in DL.

Table A.5.5.2.6.1-1: Interruption during measurements on deactivated E-UTRAN SCC supported test configurations

Config	Description
1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is only r	required to be tested in one of the supported test configurations

Table A.5.5.2.6.1-2: General test parameters for E-UTRAN – NR FR2 interruptions during measurements on deactivated E\_UTRAN SCC in asynchronous EN-DC

Parameter	Unit	Value	Comment
RF Channel Number		1, 2	One is E-UTRAN RF channel and two is E-UTRAN RF channel
Active PCell		Cell1	PCell on E-UTRAN RF channel number 1.
Configured PSCell		Cell2	PSCell on NR RF channel number 2.
Configured deactivated		Cell3	Deactivated SCell on E-UTRAN RF
SCell			channel number 1.
CP length		Normal	Applicable to cell1, cell 2 and cell3
DRX		OFF	
Measurement gap pattern Id		OFF	
SCell measurement cycle (measCycleSCell)	ms	640	
T1	S	10	

Table A.5.5.2.6.1-3: NR cell specific test parameters for E-UTRAN – NR FR2 interruptions during measurements on deactivated E UTRAN SCC in asynchronous EN-DC

Paramet	ter	Unit	Cell 2
Frequency Range			FR2
Duplex mode	Config 1,2		TDD
TDD configuration	Config 1,2		TDDConf.3.1
BW <sub>channel</sub>	Config 1,2	MHz	100: N <sub>RB,c</sub> = 66
Downlink initial BWP Configuration	Config 1,2		DLBWP.0.1
Downlink dedicated BWP Configuration	Config 1,2		DLBWP.1.1
Uplink initial BWP configuration	Config 1,2		ULBWP.0.1
Uplink dedicated BWP configuration	Config 1,2		ULBWP.1.1
PDSCH Reference measurement channel	Config 1,2		SR.3.1 TDD
RMSI CORESET Reference Channel	Config 1,2		CR.3.1 TDD
PDCCH CORESET parameters	Config 1,2		CCR.3.1 TDD
OCNG Patterns			OP.1
SMTC Configuration	Config 1,2		SMTC.1 FR2
SSB Configuration	Config 1,2		SSB.1 FR2
TRS configuration	Config 1,2		TRS.2.1 TDD
TCI state	Config 1,2		TCI.State.0
EPRE ratio of PBCH to PBC	EPRE ratio of PBCH DMRS to SSS EPRE ratio of PBCH to PBCH DMRS		
EPRE ratio of PDCCH DMRS to SSS  EPRE ratio of PDCCH to PDCCH DMRS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH to PDSCH  EPRE ratio of OCNG DMRS to SSS(Note 1)			0
EPRE ratio of OCNG to OCNG DMRS (Note 1)			
Propagation Condition			AWGN
Time offset to cell1 Note 2		ms	3

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

Note 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells

Table A.5.5.2.6.1-4: NR cell specific OTA related test parameters for E-UTRAN – NR FR2 interruptions during measurements on deactivated E UTRAN SCC in asynchronous EN-DC

	Parameter	Unit	Cell2	
Angle of a	arrival configuration		According to clause A.3.15.1	
$N_{oc}$ Note1		dBm/15kHz <sup>Note4</sup>	-112	
$N_{oc}$ Note1		dBm/SCS <sup>Note3</sup>	-102.97	
$\hat{E}_s/N_{oc}$	7	dB	17	
SS-RSRF	Note2	dBm/SCS Note4	-85.97	
$\hat{\mathrm{E}}_{_{\mathrm{s}}}/\mathrm{I}_{_{\mathrm{ot}}}$		dB	17	
Io <sup>Note2</sup>		dBm/95.04 MHz Note4	-56.90	
Note 1:	I: Interference from other cells and noise sources not specified in the test is assumed to constant over subcarriers and time and shall be modelled as AWGN of appropriate por for $N_{ac}$ to be fulfilled.			
Note 2:				
Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.				
Note 4: Note 5:		ceived by an antenna with 0d Bi gain antenna at the centre	Bi gain at the centre of the quiet zone of the quiet zone	

# A.5.5.2.6.2 Test Requirements

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed the value defined in Table A.5.5.2.6.2-1 and Table A.5.5.2.6.2-2.

Table A.5.5.2.6.2-1: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length (slot)
3	0.125	5

Table A.5.5.2.6.2-2: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length (slot)
3	0.125	5 + SMTC duration

Each interruption on E-UTRAN PCell shall not exceed 1 subframe if the PCell is not in the same band as the deactivated SCell, or 5 subframes if the PCell is in the same band as the deactivated SCell.

Each interruption on E-UTRAN PCell shall not exceed 1 subframe.

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

# A.5.5.3 SCell Activation and Deactivation Delay

### A.5.5.3.1 SCell Activation and deactivation of SCell in FR2 intra-band

# A.5.5.3.1.1 Test Purpose and Environment

The purpose of this test case is the same as for the test defined in clause A.4.5.3.1.1 except the SCell is in FR2 intraband.

The supported test configurations are shown in table A.5.5.3.1.1-1 below. The general and cell specific test parameters are the same except those described in the following clause. The listed parameter values in Tables A.5.5.3.1.1-2 and A.5.5.3.1.1-3 will replace the values of corresponding parameters in Tables A.4.5.3.1.1-2 and A.4.5.3.1.1-3. In this case, OTA related test parameters are shown in table A.5.5.3.1.1-4 below.

Table A.5.5.3.1.1-1: Supported test configurations for FR2 SCell activation case with FR2 PSCell

Configuration	Description
1	FDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2	TDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE i	s only required to pass in one of the supported test configurations

### Table A.5.5.3.1.1-2: General test parameters for FR2 SCell activation case with FR2 PSCell

Parameter	Unit	Value	Comment
Active PCell		Cell 1	Primary cell on E-UTRAN RF channel number 1. As specified in clause A.3.7.2.2

#### Table A.5.5.3.1.1-3: Cell specific test parameters for FR2 SCell activation case with FR2 PSCell

ParameterNote 5	l lmi4	Cell 2			Cell 3		
Parameter	Unit	T1	T2	T3	T1	T2	T3

SSB ARFCN		freq1	freq2		
Duplex mode		TDD	TDD		
TDD configuration		TDDConf.3.1	TDDConf.3.1		
BW <sub>channel</sub>	MHz	100: N <sub>RB,c</sub> = 66	100: N <sub>RB,c</sub> = 66		
PDSCH Reference measurement channel		SR.3.1 TDD	SR.3.1 TDD		
RMSI CORESET Reference Channel		CR.3.1 TDD	CR.3.1 TDD		
RMC CORESET Reference Channel		CCR.3.1 TDD	CCR.3.1 TDD		
DL initial BWP configuration		DLBW	/P.0.1		
DL dedicated BWP configuration		DLBW	/P.1.1		
UL initial BWP configuration		ULBW	/P.0.1		
UL dedicated BWP configuration		ULBW	/P.1.1		
OCNG Patterns		OF	P.1		
SMTC configuration		SM	ΓC.1		
SSB configuration		SSB.	1 FR2		
TCI state		TCI.S	tate.0		
TRS configuration		TRS.2	.1 TDD		
EPRE ratio of PSS to SSS					
EPRE ratio of PBCH_DMRS to SSS					
EPRE ratio of PBCH to PBCH_DMRS					
EPRE ratio of PDCCH_DMRS to SSS					
EPRE ratio of PDCCH to PDCCH_DMRS	dB	0			
EPRE ratio of PDSCH_DMRS to SSS	uБ		,		
EPRE ratio of PDSCH to PDSCH_DMRS					
EPRE ratio of OCNG DMRS to SSSNote 1					
EPRE ratio of OCNG to OCNG DMRS Note					
1					
Propagation conditions		AW			
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral					
density is achieved for all OFDM symbols					

density is achieved for all OFDM symbols.

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

SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not Note 3: settable parameters themselves.

SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver Note 4: antenna port.

Note 5: All parameters apply for configuration 1 and 2

Table A.5.5.3.1.1-4: OTA related test parameters for FR2 SCell activation case with FR2 PSCell

Parameter <sup>Note 6</sup>	Linit		Cell 2			Cell 3		
Parameter	Unit	T1	T2	Т3	T1	T2	Т3	1

Angle of arrival configuration		Setup1 according to table A.3.15.1	Setup1 according to table A.3.15.1
$N_{oc}^{ m Note1}$	dBm/15kHz <sup>N</sup> ote4	-112	-112
$N_{oc}^{ m Note1}$	dBm/SCS <sup>Note</sup>	-102.97	-102.97
$\hat{E}_s/N_{oc}$	dB	14	14
SS-RSRP <sup>Note2</sup>	dBm/SCS Note4	-88.97	-88.97
$\hat{E}_{s}/I_{ot}$	dB	14	14
Io <sup>Note2</sup>	dBm/95.04 MHz <sup>Note4</sup>	-88.80	-88.80

- Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.
- Note 2: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
- Note 5: As observed with 0dBi gain antenna at the centre of the guiet zone
- Note 6: All parameters apply for configuration 1 and 2

# A.5.5.3.1.2 Test Requirements

The test requirements defined in clause A.4.5.3.1.2 shall apply to this test case, except  $T_{activation\_time}$  will be replaced with the value  $[T_{SMTC\ SCell} + 5ms]$  as defined in clause 8.3.

# A.5.5.3.2 SCell Activation and deactivation of known SCell in FR1 for 160ms SCell measurement cycle

# A.5.5.3.2.1 Test Purpose and Environment

The purpose of this test case is the same as for the test defined in clause A.4.5.3.1.1, except PSCell is in FR2.

The supported test configurations are shown in table A.5.5.3.2.1-1 below. The general test parameters are the same in Tables A.4.5.3.1.1-2. The cell specific test parameters are given in Tables A.5.5.3.2.1-2. In this case, OTA related test parameters are the same as in table A.5.5.3.2.1-3.

Table A.5.5.3.2.1-1: Supported test configurations for FR1 SCell activation case with PSCell is FR2

Configuration	Description
1	FDD LTE PCell, Cell 2 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
	Cell 3 NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2	FDD LTE PCell, Cell 2 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
	Cell 3 NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3	FDD LTE PCell, Cell 2 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
	Cell 3 NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
4	TDD LTE PCell, Cell 2 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
	Cell 3 NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
5	TDD LTE PCell, Cell 2 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
	Cell 3 NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6	TDD LTE PCell, Cell 2 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
	Cell 3 NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is	s only required to pass in one of the supported test configurations

Table A.5.5.3.2.1-2: Cell specific test parameters for FR1 SCell activation case with FR2 PSCell

Param	eter	Unit	Cell 2 T1 T2 T3	Cell 3 T1 T2 T3
SSB ARFCN			freq2	freq1
	Config 1,4		TDD	FDD
Duplex mode	Config 2,3,5,6		TDD	TDD
	Config 1,4			Not Applicable
TDD configuration	Config 2,5		TDDConf.3.1	TDDConf.1.1
1BB comiguration			12200111.0.1	
	Config 3,6			TDDConf.2.1
	Config 1,4			10: N <sub>RB,c</sub> = 52
BW <sub>channel</sub>	Config 2,5	MHz	100: N <sub>RB,c</sub> = 66	10: N <sub>RB,c</sub> = 52
	Config 3,6			40: N <sub>RB,c</sub> = 106
DL initial BWP configuration	Config 1,2,3,4,5,6		DLB <sup>1</sup>	 WP.0.1
DL dedicated BWP configuration	Config 1,2,3,4,5,6		DLB	WP.1.1
UL initial BWP configuration UL dedicated BWP	Config 1,2,3,4,5,6 Config		ULB	WP.0.1
configuration	1,2,3,4,5,6			WP.1.1
DRx Cycle		ms	Not Ap	oplicable
PDSCH Reference	Config 1,4			SR.1.1 FDD
measurement channel	Config 2,5		SR.3.1 TDD	SR.1.1 TDD
modear of north of armor	Config 3,6			SR.2.1 TDD
RMSI CORESET	Config 1,4		0004700	CR.1.1 FDD
Reference Channel	Config 2,5		CR.3.1 TDD	CR.1.1 TDD CR.2.1 TDD
	Config 3,6 Config 1,4		+	CCR.1.1 FDD
RMC CORESET	Config 2,5		CCR.3.1 TDD	CCR.1.1 TDD
Reference Channel	Config 3,6		7	CCR.2.1 TDD
OCNG Patterns			C	PP.1
SMTC configuration				ITC.1
TCI state			TCI.State.0	NA
	Config 1,4			TRS.1.1 FDD
TRS configuration	Config 2,5		TRS.2.1 TDD	TRS.1.1 TDD
	Config 3,6		1	TRS.1.2 TDD
SSB configuration	Config 1,2,4,5 Config 3,6		SSB.1 FR2	SSB.1 FR1 SSB.2 FR1
PDSCH/PDCCH	Config 1,2,4,5			15kHz
subcarrier spacing	Config 3,6	kHz	120kHz	30kHz
EPRE ratio of PSS to SSS				
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS EPRE ratio of PDCCH to PDCCH DMRS		dB		0
EPRE ratio of PDCCH to PDCCH DMRS  EPRE ratio of PDSCH DMRS to SSS		uБ		U
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS(Note 1)				
EPRE ratio of OCNG to O	CNG DMRS (Note 1)			T
Propagation condition		-	AWGN	NA Link only, see clause A.3.7A

Note 1:	OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral
	density is achieved for all OFDM symbols.
Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant over
	and a mineral and times and a ball be used all ad as ANACON of a managinate manager and a 27 of the following

subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 3: SS-RSRP and SCH RP levels have been derived from other parameters for information purposes. They

are not settable parameters themselves.

Note 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.]

Table A.5.5.3.2.1-3: OTA related test parameters for FR1 SCell activation case with FR2 PSCell

Dore	amatar	Unit		Cell 2			Cell 3	
Parameter		Offic	T1	T2	T3	T1	T2	T3
Angle of arrival configuration			According to clause A.3.15.1					
$N_{oc}^{ m Note1}$		dBm/15kHz		-112		]		
$N_{oc}^{ m Note1}$	$N_{oc}$ Note1 Config 1,2,4,5 Config 3,6		-102.97					
SS-RSRP <sup>Note2</sup>	Config 1 2 4 5			-85.97		NA Link only, see clause		
$\hat{E}_s/N_{oc}$	Config 1,2,3,4,5,6	dB	17			A.3.7A		
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$		dB	17					
Io <sup>Note2</sup>	Config 1,2,4,5	dBm/ChBw <sup>N</sup>		56.00				
10	Config 3,6	ote4,Note6	-56.90					

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.

Note 2: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone

Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone

Note 6: ChBW is 94.04 MHz for Cell2, 9.36 MHz for Cell 3 in configurations 1,2,4,5, 38.1 MHz in configurations 3,6

# A.5.5.3.2.2 Test Requirements

The test requirements defined in clause A.4.5.3.1.2 shall apply to this test case.

A.5.5.3.3 Void

A.5.5.3.4 Void

### A.5.5.3.5 SCell Activation and deactivation of SCell in FR2

#### A.5.5.3.5.1 Test Purpose and Environment

The purpose of this test is to verify that the SCell activation and deactivation times are within the requirements stated in clause 8.3, when the SCell is in FR2.

The supported test configurations are shown in table A.5.5.3.5.1-1 below. The test parameters are the same except those described in the following clause. The listed parameter values in Tables A.5.5.3.5.1-2 will replace the values of corresponding parameters in Tables A.5.5.3.5.1-2. The test consists of three successive time periods, with duration of T1, T2 and T3, respectively. There are three carriers, E-UTRA has one cell (Cell 1), NR has two cells, PSCell (Cell 2) in FR1 and SCell (Cell 3) in FR2. Cell 1 and Cell 2 have constant signal levels throughout the test. Before the test starts the UE is connected to Cell 1 (PCell) on E-UTRAN and Cell 2 (PSCell) on NR, but is not

aware of Cell 3 (SCell) on NR. The UE is monitoring the PCell and PSCell. The UE shall be continuously scheduled in the PCell and PSCell throughout the whole test.

At the beginning of T1 the UE receives an RRC message by which the SCell (Cell 3) becomes configured on NR. During T1 the SCell is powered off and UE is not aware of SCell.

A MAC message for activation of SCell is sent by the test equipment [100ms] after the RRC message, in a slot # denoted m. The point in time at which the MAC message for activation of SCell is received at the UE antenna connector defines the start of time period T2. Immediately at beginning of T2 the transmission power of cell 3 is increased to same level as for cell 2. The UE shall be able to report valid CSI for the activated SCell at latest in slot (m+T<sub>HARQ</sub>+T<sub>activation\_time</sub>+T<sub>CSI\_Reporting</sub>) as defined in clause 8.3 provided the SCell can be successfully detected on the first attempt. The UE shall start reporting CSI in slot (m+k) and shall report CQI index 0 (out-of-range) until the SCell activation has been completed. Any PCell interruption due to activation of SCell shall occur in the slot (m+1+[T<sub>HARQ</sub>+3ms+T<sub>SMTC\_MAX</sub>+T<sub>SMTC\_duration</sub>]) as defined in clause 8.3.

Time period T3 starts when a MAC message for deactivation of the SCell, sent from the test equipment to the UE in a slot # denoted n, is received at the UE antenna connector. The UE shall carry out deactivation of the SCell at latest in slot ( $n+[T_{HARQ}+3ms]$ ) as defined in clause 8.3, and any PCell and PSCell interruption due to the deactivation shall occur in the ( $n+1+[T_{HARQ}]$ ) to ( $n+1+[T_{HARQ}+3ms]$ ) as defined in clause 8.3.

The test equipment verifies that potential interruption is carried out in the correct time span by monitoring ACK/NACK sent in PSCell during activation of SCell, respectively.

The test equipment verifies the activation time by counting the slots from the time when the SCell activation command is sent until a CSI report with other than CQI index 0 is received.

The test equipment verifies the deactivation time by counting the slots from the time when the SCell1 deactivation command is sent until CSI reporting for SCell1 is discontinued.

Table A.5.5.3.5.1-1: FR2 SCell activation in non-DRX test configurations with FR1 PSCell

Configuration	Description
1	LTE FDD PCell, Cell 2 NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
	Cell 3 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2	LTE FDD PCell, Cell 2 NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
	Cell 3 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
3	LTE FDD PCell, Cell 2 NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
	Cell 3 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
4	LTE TDD PCell, Cell 2 NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
	Cell 3 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
5	LTE TDD PCell, Cell 2 NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
	Cell 3 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
6	LTE TDD PCell, Cell 2 NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
	Cell 3 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE i	s only required to be tested in one of the supported test configurations

Table A.5.5.3.5.1-2: General test parameters for FR2 SCell activation case with FR1 PSCell

Parameter	Unit	Value	Comment
Active PCell		Cell 1	Primary cell on E-UTRAN RF channel number 1. As specified in clause A.3.7.2.2

Table A.5.5.3.5.1-3: Cell specific test parameters for FR2 SCell activation case with FR1 PSCell

Doromotor	Unit	Cell 2			Cell 3		
Parameter	Unit	T1	T2	T3	T1	T2	T3
SSB ARFCN			frea1			frea2	

Duplex mode	Config 1,4		FDD	TDD
Duplex mode	Config 2,3,5,6		TDD	TDD
	Config 1,4		Not Applicable	
TDD configuration	Config 2,5		TDDConf.1.1	TDDConf.3.1
	Config 3,6		TDDConf.2.1	
	Config 1,4		10: N <sub>RB,c</sub> = 52	
BW <sub>channel</sub>	Config 2,5	MHz	10: N <sub>RB,c</sub> = 52	100: N <sub>RB,c</sub> = 66
	Config 3,6	1	40: N <sub>RB,c</sub> = 106	
	Config 1,4		10: N <sub>RB,c</sub> = 52	
BWP BW	Config 2,5	1	10: N <sub>RB,c</sub> = 52	100: N <sub>RB,c</sub> = 66
	Config 3,6	1	$40: N_{RB,c} = 106$	
DRx Cycle		ms	Not Ap	plicable
	Config 1,4		SR.1.1 FDD	
PDSCH Reference	Config 2,5		SR.1.1 TDD	SR.3.1 TDD
measurement channel	Config 3,6		SR.2.1 TDD	614.6.1 122
	Config 1,4		CR.1.1 FDD	
RMSI CORESET	Config 2,5		CR.1.1 TDD	CR.3.1 TDD
Reference Channel	Config 3,6	1		CR.3.1 1DD
	Config 1,4		CR.2.1 TDD CCR.1.1 FDD	
RMC CORESET				000 0 4 TDD
Reference Channel	Config 2,5		CCR.1.1 TDD	CCR.3.1 TDD
OCNC Detterns	Config 3,6		CCR.2.1 TDD	2.4
OCNG Patterns				P.1
SMTC configuration			SMT	
TCI state	0 5 4 4		NA TDC 0.4 TDD	TCI.State.0
TD0 5 "	Config 1,4		TRS.2.1 TDD	TD0 0 4 TDD
TRS configuration	Config 2,5		TRS.1.1 TDD	TRS.2.1 TDD
	Config 3,6		TRS.1.2 TDD	
SSB configuration	Config 1,2,4,5		SSB.1 FR1	SSB.1 FR2
	Config 3,6		SSB.2 FR1	
PDSCH/PDCCH	Config 1,2,4,5	kHz	15 kHz	120 kHz
subcarrier spacing	Config 3,6		30 kHz	
EPRE ratio of PSS to SSS	2 t- 000	-		
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS EPRE ratio of PDCCH DMRS to SSS		1		
EPRE ratio of PDCCH to PDCCH DMRS		dB		<b>1</b>
EPRE ratio of PDSCH DMRS to SSS		uD uD		J
EPRE ratio of PDSCH to PDSCH		1		
EPRE ratio of OCNG DMRS to SSS(Note 1)		1		
EPRE ratio of OCNG to OCNG DMRS (Note 1)		1		
Propagation condition		-	N/A Link only, see clause A.3.7A	AWGN

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

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

Note 3: SS-RSRP and SCH\_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.

17

17

-56.90

Config 3,6

Config 1,2,3,4,5,6

Config 1,2,4,5

Config 3,6

Cell 2 Cell 3 **Parameter** Unit T1 T2 T3 T2 T3 According to clause Angle of arrival configuration NA A.3.15.1 dBm/15kHz -112 Config 1,2,4,5  $N_{oc}^{\rm \ Note1}$ dBm/SCS -102.97Config 3,6 Config 1,2,4,5 dBm/SCS SS-RSRPNote2 -85.97

NA Link only, see clause

A.3.7A

Table A.5.5.3.5.1-4: OTA related test parameters for FR2 SCell activation case with FR1 PSCell

Note 1:	Interference from other cells and noise sources not specified in the test is assum	ned :	to be constant over
	subcarriers and time and shall be modelled as AWGN of appropriate power for	N	to be fulfilled.

Note3

dB

dB

dBm/ChBw

Note4, Note6

- SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not Note 2: settable parameters themselves.
- SS-RSRP minimum requirements are specified assuming independent interference and noise at each Note 3: receiver antenna port.
- Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone Note 4:
- As observed with 0 dBi gain antenna at the centre of the guiet zone Note 5:
- Note 6: ChBW is 94.04 MHz for Cell2, 9.36 MHz for Cell 3 in configurations 1,2,4,5, 38.1 MHz in configurations 3,6

#### A.5.5.3.5.2 Test Requirements

The test requirements defined in clause A.5.5.3.5.2 shall apply to this test case, except Tactivation time will be replaced with the value [TBD\*T<sub>SMTC SCell</sub>+5 ms] as defined in clause 8.3.

# A.5.5.4 Void

 $\hat{E}_{s}/N_{oc}$ 

Io<sup>Note2</sup>

# A.5.5.5 Beam Failure Detection and Link recovery procedures

#### A.5.5.5.1 EN-DC Beam Failure Detection and Link Recovery Test for FR2 PSCell configured with SSB-based BFD and LR in non-DRX mode

#### A.5.5.5.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set  $q_0$  configured for a serving PSCell and that the UE performs correct SSB-based link recovery based on beam candicate set q<sub>1</sub>. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR2 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.5.5.5.1.1-1, A.5.5.5.1.1-2, A.5.5.5.1.1-3 and A.5.5.5.1.1-4 below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.5.5.5.1.1-1 shows the variation of the downlink SNR of the PCell and the SNR of the SSB in set q<sub>0</sub> in the active PSCell to emulate SSB based beam failure. Figure A.5.5.5.1.1-1 additionally shows the variation of the downlink SNR of the SSB in set q<sub>1</sub> of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [2] ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test 2.

Table A.5.5.5.1.1-1: Supported test configurations for FR2 PSCell

Configuration	Description
1	LTE FDD, TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth
2	LTE TDD, TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth
Note: The UE is only r	equired to pass in one of the supported test configurations in FR2

Table A.5.5.5.1.1-2: General test parameters for FR2 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode

Parameter		Unit	Value	Comment
			Test 1	
A (' E LITDA DO			0.11.4	
Active E-UTRA PCe			Cell 1	
E-UTRA RF Channe	ei Number		1	
Active PCell			Cell 2	
RF Channel Numbe			2 TDD	
Duplex mode	Config 1, 2			
BW <sub>channel</sub>	Config 1, 2		100: N <sub>RB,c</sub> = 66	
DL initial BWP	Config 1, 2		DLBWP.0.1	
configuration	0 5 4 0		DI DIVID 4.4	
DL dedicated	Config 1, 2		DLBWP.1.1	
BWP configuration	0 5 4 0		LII DWD o 4	
UL initial BWP	Config 1, 2		ULBWP.0.1	
configuration	Config 1, 2		ULBWP.1.1	
UL dedicated	Config 1, 2		ULBWP.T.T	
BWP configuration	0 5 4 0		TDD0 (0.4	
TDD Configuration	Config 1, 2		TDDConf.3.1	
CORESET	Config 1, 2		CR. 3.1 TDD	
Reference				
Channel	0 5 4 0		000 / 500	
SSB Configuration	Config 1, 2		SSB.1 FR2	
SMTC	Config 1, 2		SMTC.3	
Configuration	,			
PDSCH/PDCCH	Config 1, 2		120 KHz	
subcarrier spacing				
PRACH	Config 1, 2		Table A.3.8.3.4	
Configuration	Coming 1, 2		Table 7.0.0.3.4	
Comiguration				
SSB index assigned	as BFD RS (q <sub>0</sub> )		0	
000 : 1	000 00 ( )			
SSB index assigned	l as CBD RS (q₁)		1	
TCI Configuration	Config 1, 2		TBD	
OCNG parameters			OP.1	
CP length			Normal	
Correlation Matrix and Antenna			2x2 Low	
Configuration				
DCI format			1-0	
	f Control OFDM		2	
symbols				
Aggregation	on level	CCE	8	

Beam failure detecti on	Ratio of hypothe PDCCH RE ene average CSI-RS	rgy to	dB	0	
transm ission param eters	Ratio of hypothe PDCCH DMRS of average CSI-RS	energy to	dB	0	
	DMRS precoder	granularity		REG bundle size	
	REG bundle size	)		6	
DRX				OFF	
Gap patt	tern ID			gp0	
-	ncOutOfSyncThres	shold		absent	When the field is absent, the UE applies the value 0. (Table 8.1.1-1).
rsrp-Thre	esholdSSB		dBm	TBD	Threshold used for Qout LR SSB
powerCo	powerControlOffsetSS			db0	Used for deriving rsrp-ThresholdCSI-RS
beamFa	ilureInstanceMax0	Count		n1	see TS 38.321 [7], clause 5.17
beamFa	ilureDetectionTime	er		pbfd4	see TS 38.321 [7], clause 5.17
CSI-RS	configuration for orting	Config 1, 2		[CSI-RS.3.1 TDD]	
TCI state	es			[TCI.State.0]	
	for tracking	Config 1, 2		[TRS.2.1 TDD]	
	ex assigned as RL	.M RS		0, 1	
T310 Tir	ner		ms	1000	
N310				2	
T1		S	1	During this time the the UE shall be fully synchronized to cell 1	
T2				2.61	
T3			S	1.64	
T4			S	0	
T5			S	1.01	
D1			S	0.97	

Note 1: All configurations are assigned to the UE prior to the start of time period T1.

Note 2: UE-specific PDCCH is not transmitted after T1 starts.

Table A.5.5.5.1.1-3: Cell specific test parameters for FR2 PSCell for SSB-based beam failure detection and link recovery testing in non-DRX mode

Parameter	Unit			Test 1		
		T1	T2	Т3	T4	T5

EPRE ratio of PDCCH DN	dB						
EPRE ratio of PDCCH to PDCCH DMRS		dB					
EPRE ratio of PBCH DMF	dB						
EPRE ratio of PBCH to P	BCH DMRS	dB					
EPRE ratio of PSS to SS	3	dB			0		
EPRE ratio of PDSCH DN	MRS to SSS	dB					
EPRE ratio of PDSCH to	PDSCH DMRS	dB					
EPRE ratio of OCNG DM	EPRE ratio of OCNG DMRS to SSS						
EPRE ratio of OCNG to C	CNG DMRS	dB					
SNR_SSB of set q <sub>0</sub>	Config 1	dB	5	-3	-12	-12	-12
	Config 2	uБ	5	-3	-12	-12	-12
SNR SSB of set q <sub>1</sub>	Config 1	dB	-12	-12	5	5	5
SINK_SSB OF Set q1	Config 2	uБ	-12	-12	5	5	5
N Config 1		dBm/12	TBD				
$N_{oc}$	Config 2	0 KHz			TBD		
Propagation condition				TDI	L-A 30ns 7	5Hz	
NI I A CONO I III	No. 4. OONO shall be used such that the management of the allocated and a sense that all						

- Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
- Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
- Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
- Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
- Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.5.5.5.1.1-1.

Field

Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause [A.3.6].

Table A.5.5.5.1.1-4: Measurement gap configuration for FR2 PSCell for SSB-based beam failure detection and link recovery testing in non-DRX mode

Test 1

Value

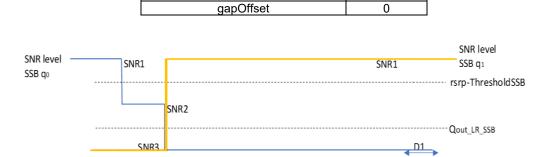


Figure A.5.5.5.1.1-1: SNR variation SSB for SSB-based beam failure detection and link recovery testing in non-DRX mode

# A.5.5.5.1.2 Test Requirements

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q<sub>1</sub>.

No later than time point F occurring no later than D1 = [960+10] ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit preamble on a beam associated with the candidate beam set  $q_1$  earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

# A.5.5.5.2 EN-DC Beam Failure Detection and Link Recovery Test for FR2 PSCell configured with SSB-based BFD and LR in DRX mode

#### A.5.5.5.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set  $q_0$  configured for a serving PSCell and that the UE performs correct SSB-based link recovery based on beam candidate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR2 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.5.5.5.2.1-1, A.5.5.5.2.1-2, A.5.5.5.2.1-3, A.5.5.5.2.1-4 and A.5.5.5.2.1-5 below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.5.5.5.2.1-1 shows the variation of the downlink SNR of the PCell and the SNR of the SSB in set  $q_0$  in the active PSCell to emulate SSB based beam failure. Figure A.5.5.5.2.1-1 additionally shows the variation of the downlink SNR of the SSB in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [2] ms. In the test, DRX configuration is enabled in PCSell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

Table A.5.5.5.2.1-1: Supported test configurations for FR2 PSCell

Configuration	Description					
1	LTE FDD, TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth					
2	LTE TDD, TDD duplex mode, 240 kHz SSB SCS, 100 MHz bandwidth					
Note: The UE is only	Note: The UE is only required to pass in one of the supported test configurations in FR2					

Table A.5.5.5.2.1-2: General test parameters for FR2 PSCell for SSB-based beam failure detection and link recovery testing in DRX mode

Unit	Value	Comment
	Test 1	
	Cell 1	
_	Jnit	

E LITDA	DF Channa	Mumbar		1	_
Active P	RF Channe	ei Number		Cell 2	
	nel Numbe	r		2	
Duplex r		Config 1, 2		TDD	
BW <sub>channe</sub>		Config 1, 2		100: N <sub>RB,c</sub> = 66	
DL initial	I DIMD	Config 1, 2		DLBWP.0.1	
		Coning 1, 2		DLBVVP.U. I	
configura		0		DI DIMD 4.4	
	ated BWP	Config 1, 2		DLBWP.1.1	
configura		0 5 4 0		LIL DIAID 0.4	
UL initial		Config 1, 2		ULBWP.0.1	
configura		0 5 4 0		LIL DIAID 4.4	
	ated BWP	Config 1, 2		ULBWP.1.1	
configura		0 5 4 0		TDD0 (0.4	
	nfiguration	Config 1, 2		TDDConf.3.1	
CORESI		Config 1		CR. 3.1 TDD	
Reference					
Channel					
SSB Cor	nfiguration	Config 1, 2		SSB.3 FR2	
CNATO		Camfig 4 C	<del>                                     </del>	CMTO	
SMTC	4:	Config 1, 2		SMTC.3	
Configur	ation				
PDSCH/	DDCCLI	Config 1, 2	<del>                                     </del>	120 KHz	
		Coning 1, 2		120 KHZ	
subcarrie	er spacing				
PRACH		Config 1, 2		Table A.3.8.3.4	
Configur	ation	Cornig 1, 2		Table A.3.0.3.4	
Cornigui	alion				
SSR inde	ev assinned	as BFD RS (q <sub>0</sub> )		0	
OOD IIId	cx assigned	43 DI D 110 (q <sub>0</sub> )		ŭ	
SSB inde	ex assigned	as CBD RS (q <sub>1</sub> )		1	
	3	- (1.7			
TCI Con	figuration	Config 1, 2		TBD	
OCNG p	arameters			OP.1	
CP lengt				Normal	
Correlati	on Matrix ar	nd Antenna		2x2 Low	
Configur	ation				
Beam	DCI forma	t		1-0	
failure	Number of	f Control OFDM		2	
detecti	symbols				
on	Aggregation	on level	CCE	8	
transm		ypothetical	dB	0	
ission		E energy to			
param		SI-RS RE energy			
eters		0,			
	Ratio of hy	ypothetical	dB	0	
		MRS energy to	45	ŭ	
		SI-RS RE energy			
	3.5.495 0				
				REG bundle size	
	DMRS pre	ecoder granularity		IVEQ pariale 2176	
	REG bund	lle size		6	
DRX				DRX.3	A.3.3.3
	tern ID			N.A.	7.10.0.0
	Gap pattern ID rlmlnSyncOutOfSyncThreshold			absent	When the field is
I	io Out Oi Oyiii	o miconola		apsciit	absent, the UE
					applies the value 0.
					(Table 8.1.1-1).
rern-Thr	esholdSSB		dBm	TBD	Threshold used for
1316-11116	JOHOIGOOD		dDiii	100	Qout_LR_SSB
					GOUL_LIV_99D

powerControlOffsetSS			db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMaxCount			n1	see TS 38.321 [7], clause 5.17
beamFailureDetectionTimer			pbfd4	see TS 38.321 [7], clause 5.17
CSI-RS configuration for CSI reporting	Config 1, 2		[CSI-RS.3.1 TDD]	A.3.14.2
TCI states			[TCI.State.0]	
CSI-RS for tracking	Config 1, 2		[TRS.2.1 TDD]	
SSB index assigned as RL	.M RS		0, 1	
T310 Timer		ms	1000	
N310			2	
T1		S	1	During this time the the UE shall be fully synchronized to cell 1
T2		S	3.37	
T3		S	2.8	
T4		S	0	
T5		S	0.61	
D1		S	0.57	
Note 1: UE-specific PD	CCH is not trar	nsmitted a	fter T1 starts.	_

Table A.5.5.5.2.1-3: Cell specific test parameters for FR2 PSCell for SSB-based beam failure detection and link recovery testing in DRX mode

Parameter		Unit			Test 1			
			T1	T2	Т3	T4	T5	
EPRE ratio of PDCCH D	MRS to SSS	dB						
EPRE ratio of PDCCH to	PDCCH DMRS	dB						
EPRE ratio of PBCH DM	RS to SSS	dB						
EPRE ratio of PBCH to F	PBCH DMRS	dB						
EPRE ratio of PSS to SS	SS	dB			0			
EPRE ratio of PDSCH D	EPRE ratio of PDSCH DMRS to SSS							
EPRE ratio of PDSCH to	PDSCH DMRS	dB						
EPRE ratio of OCNG DN	IRS to SSS	dB						
EPRE ratio of OCNG to	OCNG DMRS	dB						
SNR_SSB of set q <sub>0</sub>	Config 1	dB	5	-3	-12	-12	-12	
	Config 2	T ub	5	-3	-12	-12	-12	
SNR SSB of set q <sub>1</sub>	Config 1	dB	-12	-12	5	5	5	
SINT_SSB OF Set q1	Config 2	7 ub	-12	-12	5	5	5	
Non	λ/ Config 1				TBD			
<sup>1</sup> V oc	Config 2	0 KHz			TBD			

Propagat	ion condition		TDL-A 30ns 75Hz			
Note 1:	OCNG shall be used such that the	resources	in Cell 1 are fully allocated and a constant total			
	transmitted power spectral density is achieved for all OFDM symbols.					
Note 2:		The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.				
Note 3:	NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.					
Note 4:	I control of the cont					
Note 5:	The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.					
Note 6:	The signal contains PDCCH for UE	Es other th	an the device under test as part of OCNG.			
Note 7:	SNR levels correspond to the sign	al to noise	ratio over the SSS REs.			
Note 8:	The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.5.5.5.2.1-1.					
Note 9:			E which supports 2RX on at least one band. For nds, the SNR during T3 is modified as specified in			

Table A.5.5.5.2.1-4: Void Table A.5.5.5.2.1-5: Void

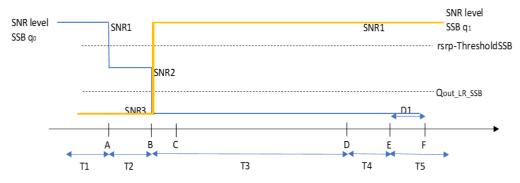


Figure A.5.5.5.2.1-1: SNR variation for SSB-based beam failure detection and link recovery testing in non-DRX mode

# A.5.5.5.2.2 Test Requirements

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set  $q_1$ .

No later than time point F occurring no later than D1 = [560+10] ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit preamble on a beam associated with the candidate beam set  $q_1$  earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

# A.5.5.5.3 EN-DC Beam Failure Detection and Link Recovery Test for FR2 PSCell configured with CSI-RS-based BFD and LR in non-DRX mode

### A.5.5.5.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set  $q_0$  configured for a serving PSCell and that the UE performs correct CSI-RS-based link recovery based on beam candicate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR2 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.5.5.5.3.1-1, A.5.5.5.3.1-2, and A.5.5.5.3.1-3 below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.5.5.5.3.1-1 shows the variation of the downlink SNR of the PCell and the SNR of the CSI-RS in set  $q_0$  in the active PSCell to emulate CSI-RS based beam failure. Figure A.5.5.5.3.1-1 additionally shows the variation of the downlink SNR of the CSI-RS in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [2] ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements without gaps.

Table A.5.5.5.3.1-1: Supported test configurations for FR2 PSCell

Configuration	Description
1	LTE FDD, TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth

Table A.5.5.3.1-2: General test parameters for FR2 PSCell for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode

Parame	Parameter		Value	Comment
			Test 1	
Active E-UTRA PCell			Cell 1	
E-UTRA RF Channel I	Number		1	
Active PSCell			Cell 2	
RF Channel Number	-		2	
Duplex mode	Config 1		TDD	
TDD Configuration	Config 1		TDDConf.3.1	
CORESET Reference Channel	Config 1		CR.3.1 TDD	A.3.1.2
SSB Configuration	Config 1		SSB.1 FR2	A.3.10
SMTC Configuration	Config 1		SMTC.3	A.3.11
PDSCH/PDCCH	Config 1		120 KHz	
subcarrier spacing	_			
csi-RS-Index assigned	l as beam failure		0	
detection RS in set q <sub>0</sub>				
TRS configuration			TRS.2.1 TDD	
TCI configuration			CSI-RS.Config.0	
OCNG parameters			OP.1	A.3.2.1
CP length			Normal	
Correlation Matrix and	Antenna	·	2x2 Low	·
Configuration				
Beam failure	DCI format		1-0	
detection	Number of		2	
transmission	Control OFDM			
parameters	symbols			

	Aggregation	CCE	8	
	level Ratio of	i.	•	
		dB	0	
	hypothetical PDCCH RE			
	energy to			
	average CSI- RS RE energy			
	Ratio of	dB	0	
	hypothetical	иь	U	
	PDCCH DMRS			
	energy to			
	average CSI-			
	RS RE energy			
	DMRS		REG bundle size	
	precoder			
	granularity			
	REG bundle		6	
	size			
DRX			OFF	
Gap pattern ID			N.A.	
csi-RS-Index assigned	as candidate		1	
beam detection RS in				
rlmInSyncOutOfSyncT	hreshold		absent	When the field is
				absent, the UE
				applies the value
				0. (Table 8.1.1-1).
rsrp-ThresholdSSB		dBm	TBD	Threshold used
0 1 10 11 10 10				for Q <sub>in_LR_SSB</sub>
powerControlOffsetSS			db0	Used for deriving
				rsrp-
beamFailureInstanceM	10		4	ThresholdCSI-RS see TS 38.321
beamFallureInstanceiv	laxCount		n1	
beamFailureDetection	Timor		pbfd4	[7], clause 5.17 see TS 38.321
DeamrailureDetection	HIHE		pbiu <del>4</del>	[7], clause 5.17
CSI-RS configuration	Config 1		CSI-RS.3.2 TDD	A.3.14.2
for q <sub>0</sub> and q <sub>1</sub>	Coming		COI-NO.3.2 TDD	A.J. 14.2
CSI-RS configuration	Config 1		CSI-RS.3.1 TDD	A.3.14.2
for CSI reporting	Oomig i		001-1(0.0.1 100	71.0.14.2
csi-RS-Index	Config 1		CSI-RS.3.2 TDD	A.3.14.2
assigned as RLM RS	Coming 1		001110.0.2 188	7
T310 Timer		ms	1000	
N310			2	
T1		S	1	During this time
				the the UE shall
				be fully
				synchronized to
				cell 1
T2		S	1.17	
T3		S	0.9	
T4		S	0	
T5		S	0.31	
D1		S	0.27	
Note 1: UE-specific	PDCCH is not tran	smitted after	r 11 starts.	

Table A.5.5.5.3.1-3: Cell specific test parameters for FR2 PSCell for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode

Parameter		Unit			Test 1		
			T1	T2	Т3	T4	T5
EPRE ratio of PDCCH DN	MRS to SSS	dB					
EPRE ratio of PDCCH to	PDCCH DMRS	dB					
EPRE ratio of PBCH DMF	RS to SSS	dB					
EPRE ratio of PBCH to P	BCH DMRS	dB					
EPRE ratio of PSS to SS	3	dB			0		
EPRE ratio of PDSCH DN	IRS to SSS	dB					
EPRE ratio of PDSCH to	PDSCH DMRS	dB					
EPRE ratio of OCNG DM	RS to SSS	dB					
EPRE ratio of OCNG to C	CNG DMRS	dB					
SNR_CSI-RS of set q <sub>0</sub>	Config 1	dB	5	-3	-12	-12	-12
SNR_CSI-RS of set q <sub>1</sub>	Config 1	dB	-12	-12	5	5	5
√ Config 1		dBm/15			TBD		
$N_{oc}$		KHz					
Propagation condition TDL-A 30ns 75Hz			5Hz				

- Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
- Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
- Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
- Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
- Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.5.5.5.3.1-1.
- Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause [A.3.6].

Table A.5.5.5.3.1-4: Void Table A.5.5.5.3.1-5: Void

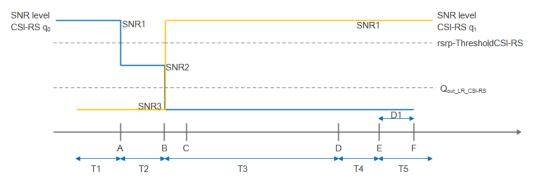


Figure A.5.5.3.1-1: SNR variation for CSI-RS based beam failure detection and link recovery testing in non-DRX mode

### A.5.5.5.3.2 Test Requirements

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the shall detect beam failure and initiat link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q<sub>1</sub>.

No later than time point F occurring no later than D1 = [260+10] ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit preamble on a beam associated with the candidate beam set  $q_1$  earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

# A.5.5.5.4 EN-DC Beam Failure Detection and Link Recovery Test for FR2 PSCell configured with CSI-RS-based BFD and LR in DRX mode

#### A.5.5.5.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set  $q_0$  configured for a serving PSCell and that the UE performs correct CSI-RS-based link recovery based on beam candicate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR2 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.5.5.5.4.1-1, A.5.5.5.4.1-2, A.5.5.5.4.1-3, and A.5.5.5.4.1-4 below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.5.5.5.4.1-1 shows the variation of the downlink SNR of the PCell and the SNR of the CSI-RS in set  $q_0$  in the active PSCell to emulate CSI-RS based beam failure. Figure A.5.5.5.4.1-1 additionally shows the variation of the downlink SNR of the CSI-RS in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [2] ms. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

Table A.5.5.5.4.1-1: Supported test configurations for FR2 PSCell

Configuration	Description		
1	LTE FDD, TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth		

Table A.5.5.5.4.1-2: General test parameters for FR2 PSCell for CSI-RS-based beam failure detection and link recovery testing in DRX mode

Parameter		Unit	Value	Comment
			Test 1	
Active E-UTRA PCell			Cell 1	
E-UTRA RF Channel Number			1	
Active PSCell			Cell 2	
RF Channel Number			2	
Duplex mode	Config 1		TDD	
TDD Configuration	Config 1		TDDConf.3.1	
CORESET Reference	Config 1		CR.3.1 TDD	A.3.1.2
Channel	_			

CCD Configuration	Config 1		CCD 4 FD2	A 2 10
SSB Configuration	Config 1		SSB.1 FR2	A.3.10
SMTC Configuration	Config 1		SMTC.3	A.3.11
PDSCH/PDCCH	Config 1		120 KHz	
subcarrier spacing				
csi-RS-Index assigned as beam failure			0	
detection RS in set q <sub>0</sub>				
TRS configuration			TRS.2.1 TDD	
TCI configuration			CSI-RS.Config.0	
OCNG parameters			OP.1	A.3.2.1
CP length			Normal	
Correlation Matrix and Antenna			2x2 Low	
Configuration				
Beam failure detection	DCI format		1-0	
transmission	Number of		2	
parameters	Control OFDM			
'	symbols			
	Aggregation	CCE	8	
	level	002	j -	
	Ratio of	dB	0	
	hypothetical	l db		
	PDCCH RE			
	energy to			
	average CSI-			
	RS RE energy	4D	0	
	Ratio of	dB	0	
	hypothetical			
	PDCCH DMRS			
	energy to			
	average CSI-			
	RS RE energy			
	DMRS		REG bundle size	
	precoder			
	granularity			
	REG bundle		6	
	size			
DRX			DRX.3	A.3.3.3
Gap pattern ID			N.A.	
csi-RS-Index assigned as candidate			1	
beam detection RS in set q <sub>1</sub>				
rlmInSyncOutOfSyncThreshold			absent	When the field is
				absent, the UE
				applies the value
				0. (Table 8.1.1-1).
rsrp-ThresholdSSB		dBm	TBD	Threshold used
Torp Timedilolaeds				for Qin LR SSB
powerControlOffsetSS			db0	Used for deriving
pana. control of the			450	rsrp-
				ThresholdCSI-RS
beamFailureInstanceMaxCount			n1	see TS 38.321
Dearm andremstancewa	beam-allureinstancewaxCount		111	[7], clause 5.17
h F-ih D-A			phfd1	
beamFailureDetectionTimer		1	pbfd4	see TS 38.321
	11101			
COLDC confirmation			001 00 0 0 700	[7], clause 5.17
CSI-RS configuration	Config 1		CSI-RS.3.2 TDD	A.3.14.2
for q <sub>0</sub> and q <sub>1</sub>	Config 1			A.3.14.2
for q <sub>0</sub> and q <sub>1</sub> CSI-RS configuration			CSI-RS.3.2 TDD	
for q <sub>0</sub> and q <sub>1</sub> CSI-RS configuration for CSI reporting	Config 1		CSI-RS.3.1 TDD	A.3.14.2 A.3.14.2
for q <sub>0</sub> and q <sub>1</sub> CSI-RS configuration for CSI reporting csi-RS-Index assigned	Config 1			A.3.14.2
for q <sub>0</sub> and q <sub>1</sub> CSI-RS configuration for CSI reporting csi-RS-Index assigned as RLM RS	Config 1		CSI-RS.3.1 TDD	A.3.14.2 A.3.14.2
for q <sub>0</sub> and q <sub>1</sub> CSI-RS configuration for CSI reporting csi-RS-Index assigned	Config 1	ms	CSI-RS.3.1 TDD	A.3.14.2 A.3.14.2
for q <sub>0</sub> and q <sub>1</sub> CSI-RS configuration for CSI reporting csi-RS-Index assigned as RLM RS	Config 1	ms	CSI-RS.3.1 TDD	A.3.14.2 A.3.14.2

T1	s	1	During this time the the UE shall be fully synchronized to cell 1	
T2	S	5.43		
T3	S	5.16		
T4	S	0		
T5	S	0.31		
D1	S	0.27		
Note 1: UE-specific PDCCH is not transmitted after T1 starts.				

Table A.5.5.5.4.1-3: Cell specific test parameters for FR2 PSCell for CSI-RS-based beam failure detection and link recovery testing in DRX mode

Parameter		Unit			Test 1		
			T1	T2	T3	T4	T5
EPRE ratio of PDCCH DM	IRS to SSS	dB					
EPRE ratio of PDCCH to F	PDCCH DMRS	dB					
EPRE ratio of PBCH DMR	S to SSS	dB					
EPRE ratio of PBCH to PE	CH DMRS	dB					
EPRE ratio of PSS to SSS	}	dB			0		
EPRE ratio of PDSCH DM	RS to SSS	dB					
EPRE ratio of PDSCH to F	PDSCH DMRS	dB					
EPRE ratio of OCNG DMF	RS to SSS	dB					
EPRE ratio of OCNG to O	CNG DMRS	dB					
SNR_CSI-RS of set q <sub>0</sub>	Config 1	dB	5	-3	-12	-12	-12
SNR_CSI-RS of set q <sub>1</sub>	Config 1	dB	-12	-12	5	5	5
N Config 1		dBm/15			TBD		
$N_{oc}$		KHz					
Propagation condition			TDL-A 30ns 75Hz				

- Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
- Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
- Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
- Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
- Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.5.5.5.4.1-1.
- Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause [A.3.6].

Table A.5.5.5.4.1-4: Void
Table A.5.5.5.4.1-5: Void
Table A.5.5.5.4.1-6: Void

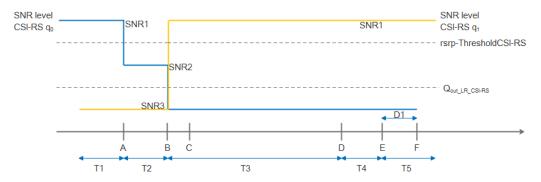


Figure A.5.5.5.4.1-1: SNR variation for CSI-RS-based beam failure detection and link recovery testing in DRX mode

# A.5.5.5.4.2 Test Requirements

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the shall detect beam failure and initiat link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set  $q_1$ .

No later than time point F occurring no later than D1 = [260+10] ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit preamble on a beam associated with the candidate beam set  $q_1$  earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

# A.5.5.5.5 EN-DC scheduling availability restriction during Beam Failure Detection and Link Recovery for FR2 PSCell configured with SSB-based BFD and LR in non-DRX mode

# A.5.5.5.5.1 Test Purpose and Environment

The purpose is to test scheduling availability restrictions when the UE is performing beam failure detection or when the UE is performing L1-RSRP measurement for candidate beam detection, when no DRX is used. This test will verify the scheduling availability restriction requirements for SSB based beam failure detection and link recovery for an FR2 serving cell in clause 8.5.7 and 8.5.8.

The test parameters are given in Tables A.5.5.5.5.5.1-1, A.5.5.5.5.1-2 and A.5.5.5.5.1-3 below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.5.5.5.1-3 shows the variation of the downlink SNR of the PCell and the SNR of the SSB in set  $q_0$  in the active PSCell to emulate SSB based beam failure. Figure A.5.5.5.1-3 additionally shows the variation of the downlink SNR of the SSB in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2.

The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. This test will focus on the scheduling availability during beam failure detection and candidate beam detection. In the test, DRX configuration is not enabled. Test is to test the scheduling availability restriction of UE performing beam failure detection and candidate beam detection when SSB RS configured for Beam failure detection and candidate beam detection. During the test the UE is scheduled to transmit continuously in UL.

Table A.5.5.5.1-1: Supported test configurations for FR2 PSCell

Configuration	Description
1	LTE FDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
2	LTE TDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
Note: The UE	is only required to be tested in one of the supported test configurations

Table A.5.5.5.5.1-2: General test parameters for FR2 PSCell for SSB-based beam failure detection and link recovery testing in non-DRX mode

Parame	ter	Unit	Value	Comment
- urumo		J	Test 1	Common
Active E-UTRA PCell		Cell 1		
E-UTRA RF Channel Numb	per		1	
Active PSCell			Cell 2	
RF Channel Number	T 0 5 4 0		2	
Duplex mode	Config 1,2		TDD	
TDD Configuration	Config 1,2		TDDConf.3.1	
DL initial BWP	Config 1, 2		DLBWP.0.1	
configuration			5/5/45/	
DL dedicated BWP	Config 1, 2		DLBWP.1.1	
configuration	Canfin 1 0		LILDWD 0.4	
UL initial BWP	Config 1, 2		ULBWP.0.1	
configuration UL dedicated BWP	Config 1, 2		ULBWP.1.1	
configuration	Cornig 1, 2		ULBWP.1.1	
CORESET Reference	Config 1,2		CR. 3.1 TDD	
Channel	Coming 1,2		OIX. 3.1 1DD	
SSB Configuration	Config 1,2		SSB.1 FR2	
SMTC Configuration	Config 1,2		SMTC.1	
PDSCH/PDCCH	Config 1,2		120 KHz	
subcarrier spacing	Joining 1,2		120 1012	
SSB index assigned as BF	D RS (a <sub>0</sub> )		0	
SSB index assigned as CB			1	
TRS configuration	D 110 (q1)		TRS.2.1 TDD	
TCI configuration			TCI.State.0	
OCNG parameters			OP.1	
AoA Setup			Setup 1	A.3.15.1
CP length			Normal	
Correlation Matrix and Ante	enna Configuration		2x2 Low	
	DCI format		1.0	
	Number of Control		1-0 2	
Beam failure detection	OFDM symbols		2	
transmission parameters	Aggregation level	CCE	8	
maniormosteri paramitotore	Ratio of	dB	0	
	hypothetical	u.b	Ŭ	
	PDCCH RE			
	energy to average			
	CSI-RS RE energy			
	Ratio of	dB	0	
	hypothetical			
	PDCCH DMRS			
	energy to average			
	CSI-RS RE energy		DEO hamalla aina	
	DMRS precoder		REG bundle size	
	granularity REG bundle size		6	
DRX REG bundle size			OFF	DRX is not in use
Gap pattern ID			N.A.	No measurement gap
Cap pattorn ib			14.74.	pattern is configured
ssb-Index			2	Number of SSB indexes
322 11337			_	used for beam failure
				detection
rlmInSyncOutOfSyncThreshold			absent	When the field is absent,
				the UE applies the value 0.
			(Table 8.1.1-1).	
rsrp-ThresholdSSB		dBm	[-94.5]	Threshold used for
			$Q_{out\_LR\_SSB}$	

powerControlOffsetSS			db0	Used for deriving rsrp- ThresholdCSI-RS
beamFailureInstanceMaxCo		n2	see TS 38.321 [7], clause 5.17	
beamFailureDetectionTime	r		pbfd4	see TS 38.321 [7], clause 5.17
CSI-RS Configuration for reporting	Config 1, 2		CSI-RS.3.1 TDD	A.3.14.2
T310 Timer		ms	1000	
N310			2	
T1		S	1	During this time the UE shall be fully synchronized to cell 1
T2		S	2.6	
T3		S	1.64	
T4		S	0	
T5		S	1.01	
D1	S	0.97		
Note 1: All configurations are assigned to the UE prior to the start of time period T1.  Note 2: UE-specific PDCCH is not transmitted after T1 starts.				

Table A.5.5.5.5.1-3: Cell specific test parameters for FR2 PSCell for SSB-based beam failure detection and link recovery testing in non-DRX mode

Parameter		Unit			Test 1		
			T1	T2	Т3	T4	T5
EPRE ratio of PDCCH [	OMRS to SSS	dB					
EPRE ratio of PDCCH t	o PDCCH DMRS	dB					
EPRE ratio of PBCH DN	MRS to SSS	dB					
EPRE ratio of PBCH to	PBCH DMRS	dB					
EPRE ratio of PSS to S	SS	dB			0		
EPRE ratio of PDSCH DMRS to SSS		dB					
EPRE ratio of PDSCH to	o PDSCH DMRS	dB					
EPRE ratio of OCNG DI	MRS to SSS	dB					
EPRE ratio of OCNG to	OCNG DMRS	dB					
SNR_SSB of set q <sub>0</sub>	Config 1	dB	5	-3	-12	-12	-12
	Config 2	uБ	5	-3	-12	-12	-12
CND CCD of not a	Config 1	dB	-12	-12	5	5	5
SNR_SSB of set q <sub>1</sub>	Config 2	T UB	-12	-12	5	5	5
$N_{oc}$ Config 1 Config 2		dBm/15			-104.7		
		KHz			-104.7		

Propagat	tion condition		TDL-A 30ns 75Hz		
Note 1:	OCNG shall be used such that the	resources	in Cell 1 are fully allocated and a constant total		
	transmitted power spectral density	is achieve	d for all OFDM symbols.		
Note 2:	The uplink resources for CSI repor	ting are as	ssigned to the UE prior to the start of time period T1.		
Note 3:	NZP CSI-RS resource set configur	ation for C	SI reporting are assigned to the UE prior to the start		
	of time period T1.				
Note 4:	Measurement gap configuration is	Measurement gap configuration is assigned to the UE prior to the start of time period T1.			
Note 5:	The timers and layer 3 filtering related parameters are configured prior to the start of time period				
	T1.				
Note 6:	The signal contains PDCCH for UEs other than the device under test as part of OCNG.				
Note 7:	SNR levels correspond to the signal to noise ratio over the SSS REs.				
Note 8:	The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3				
	respectively in figure A.5.5.5.5.1-1.				
Note 9:	The SNR values are specified for testing a UE which supports 2RX on at least one band. For				
	testing of a UE which supports 4RX	X on all ba	nds, the SNR during T3 is modified as specified in		
	clause [A.3.6].		-		

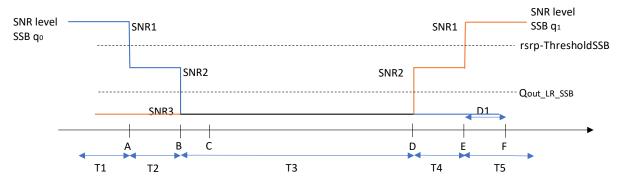


Figure A.5.5.5.1-1: SNR variation SSB for SSB-based beam failure detection and link recovery testing in non-DRX mode

# A.5.5.5.5.2 Test Requirements

The UE behaviour during time duration T3 follows the requirements defined in clause 8.5.7.3:

- The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/CSI-RS for tracking/CSI-RS for CQI on BFD-RS symbols to be measured for beam failure detection.

The UE behaviour during time durations T4 and T5 follows the requirements defined in clause 8.5.8.3:

- The UE is not expected to transmit PUCCH/PUSCH or receive PDCCH/PDSCH on reference symbols to be measured for candidate beam detection.

# A.5.5.6 Active BWP switch

# A.5.5.6.1 DCI-based and Timer-based Active BWP Switch

# A.5.5.6.1.1 E-UTRAN – NR PSCell FR2 DL active BWP switch with non-DRX in synchronous EN-DC

# A.5.5.6.1.1.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement defined in TS38.133 clause 8.6, and interruption requirement for E-UTRA victim cell defined in TS36.133 clause 7.32.2.7. Supported test configurations are shown in Table A.5.5.6.1.1.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1), and one NR PSCell (Cell 2) as given in Table A.5.5.6.1.1.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of NR PSCell is specified in Table A.5.5.6.1.1.1-3 below. The OTA related test parameters for FR2 is shown in Table A.5.5.6.1.1.1-4.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

PDCCHs indicating new transmissions shall be sent continuously on PSCell (Cell 2) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 2 and the time duration of T2.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), and Cell 2 (PSCell) on radio channel 2 (PSCC).
- UE is configured with 2 different UE-specific downlink bandwidth parts for PSCell, BWP-1 and BWP-2, in Cell 2 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.
- UE is indicated in firstActiveDownlinkBWP-Id that the active DL BWP is BWP-1 in PSCell.
- UE is configured with a *bwp-InactivityTimer* timer value for PSCell.

All cells have constant signal levels throughout the test.

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

During T1,

Time period T1 starts when a DCI format 1\_1 command for PSCell DL BWP switch, sent from the test equipment to the UE, is received at the UE side in PSCell's slot # denoted i. The UE should switch its bandwidth part from BWP-1 to BWP-2.

The UE shall be able to receive PDSCH at the beginning of the DL slot right after PSCell's DL slot  $(i+T_{BWPswitchDelay})$  as defined in clause 8.6 and starts to report valid ACK/NACK for the PSCell no later than at the beginning of the DL slot right after slot  $(i+T_{BWPswitchDelay}+kI)$ . The UE shall be continuously scheduled on PSCell's BWP-2 starting from the beginning of the DL slot right after slot  $(i+T_{BWPswitchDelay})$ .

The starting time of PCell(Cell 1) interruption due to BWP switch on PSCell shall occur within the BWP switch delay.

During T2, the test equipment won't transmit DCI format for PDSCH reception on PSCell(Cell 2).

During T3,

The time period T3 starts from the slot #j, where j is the beginning slot of the DL subframe immediately after the slot wherein *bwp-InactivityTimer* timer expires. The UE should switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1.

The UE shall be able to receive PDSCH at the beginning of the DL slot right after PSCell's DL slot  $(j+T_{BWPswitchDelay})$  as defined in clause 8.6 and starts to report valid ACK/NACK for the PSCell at latest at the beginning of the DL slot right after slot  $(j+T_{BWPswitchDelay}+kI)$ . The UE shall be continuously scheduled on PSCell's BWP-1 starting from the beginning of the DL slot right after slot  $(j+T_{BWPswitchDelay})$ .

The starting time of PCell(Cell 1) interruption due to BWP switch of PSCell shall occur within the BWP switch delay.

The test equipment verifies the DL BWP switch time in PSCell by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK is received.

The test equipment verifies that potential interruption to E-UTRA PCell is carried out in the correct time span by monitoring ACK/NACK sent in PCell during BWP switch of PSCell, respectively.

Table A.5.5.6.1.1.1-1: DL BWP switch supported test configurations

	Config	Description
1		LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2		LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note 1:	The UE is only re	equired to be tested in one of the supported test configurations
Note 2:	A UE which fulfile	s the requirements in test case A.5.5.2.2 can skip the test cases in A.5.5.2.1.

Table A.5.5.6.1.1.1-2: General test parameters for DL BWP switch in synchronous EN-DC

Parameter	Unit	Value	Comment
E-UTRA RF Channel		1	One E-UTRA radio channel is used for this
Number		'	test
NR RF Channel Number		2	One NR radio channel is used for this test
Active PCell		Cell 1	PCell on RF channel number 1.
Active PSCell		Cell 2	PSCell on RF channel number 2.
CP length		Normal	
DRX		OFF	For both PCell and PSCell
bwp-InactivityTimer	ms	[200]	
Cell-individual offset for cells	dB	0	Individual offset for cells on PCC.
on RF channel number 1	uБ	U	
Cell-individual offset for cells	dB	0	Individual offset for cells on PSCC.
on RF channel number 2	GD.	0	
Cell2 timing offset to cell1	μS	3	Synchronous EN-DC
T1	S	[0.2]	
T2	S	[0.2]	
T3	S	[0.2]	

Table A.5.5.6.1.1.1-3: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC

Parameter	Unit	Cell 2
Frequency Range		FR2
Duplex mode		TDD
TDD configuration		TDDConf.3.1
BW <sub>channel</sub>		100 MHz: N <sub>RB,c</sub> = 66
Active BWP ID		1, 2
Initial DL BWP Configuration		DLBWP.0.2 Note 2
Active DL BWP-1 Configuration		DLBWP.1.1 Note 2
Active DL BWP-2 Configuration		DLBWP.1.3 Note 2
Initial UL BWP Configuration		ULBWP.0.2 Note 2
Active UL BWP-1 Configuration		ULBWP.1.1 Note 2
Active UL BWP-2 Configuration		ULBWP.1.3 Note 2
PDSCH Reference measurement channel		SR.3.1 TDD
RMSI CORESET parameters		CR.3.1 TDD
Dedicated CORESET parameters		CCR.3.1 TDD
OCNG Patterns		OP.1
SSB Configuration		SSB.1 FR2
SMTC Configuration		SMTC.1
TCI State		TCI.State.0
TRS Configuration		TRS.2.1 TDD
Correlation Matrix and Antenna		1x2 Low
Configuration		
EPRE ratio of PSS to SSS	dB	0
EPRE ratio of PBCH DMRS to SSS		
EPRE ratio of PBCH to PBCH DMRS		
EPRE ratio of PDCCH DMRS to SSS	]	
EPRE ratio of PDCCH to PDCCH DMRS	]	
EPRE ratio of PDSCH DMRS to SSS	]	
EPRE ratio of PDSCH to PDSCH	1	
EPRE ratio of OCNG DMRS to SSS(Note 1)		
EPRE ratio of OCNG to OCNG DMRS (Note		
1)		
Propagation Condition		AWGN

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

Note 2: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3].

Table A.5.5.6.1.1.1-4: OTA related test parameters for DL BWP switch in synchronous EN-DC

Parameter	Unit	Cell 2				
Angle of arrival configuration		According to clause A.3.15.1				
N <sub>oc</sub> Note 1	dBm/15	-112				
	kHz					
Noc <sup>Note 1</sup>	dBm/SCS	-103				
SS-RSRP Note 2	dBm/120	-85				
	kHz Note3					
Ê <sub>s</sub> /I <sub>ot</sub>	dB	18				
lo <sup>Note2</sup>	dBm/95.04	-56				
	MHz Note4					
Note 1: Interference from other cells and r	oise sources r	not specified in the test is				
assumed to be constant over subcarriers and time and shall be modelled as						
AWGN of appropriate power for N	AWGN of appropriate power for N₀c to be fulfilled.					
Note 2: SS-RSRP and lo levels have beer	Note 2: SS-RSRP and lo levels have been derived from other parameters for					
information purposes. They are no	t settable para	meters themselves.				
Note 3: SS-RSRP minimum requirements	Note 3: SS-RSRP minimum requirements are specified assuming independent					
interference and noise at each rec	interference and noise at each receiver antenna port.					
Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the						
quiet zone						
Note 5: As observed with 0dBi gain antenna	at the centre	of the quiet zone.				

## A.5.5.6.1.1.2 Test Requirements

During T1, the UE shall start to send the ACK for PSCell in the DL slot right after DL slot  $(i+T_{BWPswitchDelay}+kI)$ .

During T3, the UE shall start to send the ACK for PSCell in the DL slot right after DL slot  $(j+T_{BWPswitchDelay}+kI)$ .

Where, k1 is the timing between DL data receiving and acknowledgement as specified in [7].

Depending on UE capability *bwp-SwitchingDelay* [2], UE shall finish BWP switch within the time duration  $T_{BWPswitchDelay}$  defined in Table 8.6.2-1.

All of the above test requirements shall be fulfilled in order for the observed PSCell active BWP switch delay to be counted as correct.

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

During T1, the start time of PCell interruption during PSCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start time of PCell interruption during PSCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of PCell shall not be longer than the interruption duration specified for active BWP switch in TS36.133 Clause 7.32.2.7.

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch interruption to be counted as correct.

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

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK in the DL slot right after DL slot (i+YI), (j+Y2), then the UE shall use the next available uplink resource for reporting the corresponding ACK.

Editor's note: whether E-UTRA PCell's interruption test requirement is needed or not depends on whether E-UTRA Pcell's interruption could be tested when PSCell is FR2 cell.

# A.5.5.6.1.2 E-UTRAN – NR PSCell FR2 DL active BWP switch with FR2 SCell in non-DRX in synchronous EN-DC

## A.5.5.6.1.2.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement defined in clause 8.6.2, and interruption requirements for NR victim cell defined in clause 8.2.1.2.7 and interruption requirement for E-UTRA victim cell defined in TS36.133 clause 7.32.2.7. Supported test configurations are shown in Table A.5.5.6.1.2.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1), one NR PSCell (Cell 2) and one NR SCell (Cell 3) as given in Table A.5.5.6.1.2.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of NR PSCell and SCell are specified in Table A.5.5.6.1.2.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) and SCell (Cell 3) to ensure that the UE will have ACK/NACK sending.

PDCCHs indicating new transmissions shall be sent continuously on PSCell (Cell 2) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 2 and the time duration of T2.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), Cell 2 (PSCell) on radio channel 2 (PSCC) and Cell 3 (SCell) on radio channel 3 (SCC).
- UE is configured with 2 different UE-specific downlink bandwidth parts for PSCell, BWP-1 and BWP-2, in Cell 2 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.
- UE is configured with 1 UE-specific downlink bandwidth parts the same as initial BWP for SCell, BWP-0 in Cell 3 before starting the test.
- UE is indicated in firstActiveDownlinkBWP-Id that the active DL BWP is BWP-1 in PSCell.
- UE is indicated in firstActiveDownlinkBWP-Id that the active DL BWP is BWP-0 in SCell.
- UE is configured with a bwp-InactivityTimer timer value for PSCell.

All cells have constant signal levels throughout the test.

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

During T1,

Time period T1 starts when a DCI format 1\_1 command for PSCell DL BWP switch, sent from the test equipment to the UE, is received at the UE side in PSCell's slot # denoted i. The UE shall switch its bandwidth part from BWP-1 to BWP-2.

The UE shall be able to receive PDSCH at the beginning of the DL slot right after PSCell's DL slot  $(i+T_{BWPswitchDelay})$  as defined in clause 8.6 and starts to report valid ACK/NACK for the PSCell no later than at the beginning of the DL slot right after slot  $(i+T_{BWPswitchDelay}+kI)$ . The UE shall be continuously scheduled on PSCell's BWP-2 starting from the beginning of the DL slot right after slot  $(i+T_{BWPswitchDelay})$ .

PCell(Cell 1) interruption due to BWP switch on PSCell shall occur within the BWP switch delay.

SCell(Cell 3) interruption due to BWP switch on PSCell shall occur within the BWP switch delay.

During T2, the test equipment won't transmit DCI format for PDSCH reception on PSCell(Cell 2).

During T3,

The time period T3 starts from the slot #j immediately after the slot wherein bwp-InactivityTimer timer expires. The UE shall switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1.

The UE shall be able to receive PDSCH at the beginning of the DL slot right after PSCell's DL slot  $(j+T_{BWPswitchDelay})$  as defined in clause 8.6 and starts to report valid ACK/NACK for the PSCell at latest at the beginning of the DL slot right after slot  $(j+T_{BWPswitchDelay}+kI)$ . The UE shall be continuously scheduled on PSCell's BWP-1 starting from the beginning of the DL slot right after slot  $(j+T_{BWPswitchDelay})$ .

PCell(Cell 1) interruption due to BWP switch of PSCell shall occur within the BWP switch delay.

SCell(Cell 3) interruption due to BWP switch of PSCell shall occur within the BWP switch delay.

The test equipment verifies the DL BWP switch time in PSCell by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK is received.

The test equipment verifies that potential interruption to E-UTRA PCell and NR SCell is carried out in the correct time span by monitoring ACK/NACK sent in PCell and SCell during BWP switch of PSCell, respectively.

Table A.5.5.6.1.2.1-1: DL BWP switch supported test configurations

	Config	Description		
1		LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode		
2		LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode		
Note 1:	The UE is only required to be tested in one of the supported test configurations			
Note 2:	A UE which fulfils the requirements in test case A.5.5.6.1.2 can skip the test cases in A.5.5.6.1.1.			
Note 3:	NR configuration	NR configuration is the same for PSCell and SCells.		

Table A.5.5.6.1.2.1-2: General test parameters for DL BWP switch in synchronous EN-DC

Parameter	Unit	Value	Comment
E-UTRA RF Channel		1	One E-UTRA radio channel is used for this
Number		ı	test
NR RF Channel Number		2, 3	Two NR radio channel is used for this test
Active PCell		Cell 1	PCell on RF channel number 1.
Active PSCell		Cell 2	PSCell on RF channel number 2.
Active SCell		Cell 3	SCell on RF channel number 3.
CP length		Normal	
DRX		OFF	
bwp-InactivityTimer	ms	[200]	
Cell-individual offset for cells	dB	0	Individual offset for cells on PCC.
on RF channel number 1	uБ	0	
Cell-individual offset for cells	dB	0	Individual offset for cells on PSCC.
on RF channel number 2	uБ		
Cell-individual offset for cells	dB	0	Individual offset for cells on SCC.
on RF channel number 3	uD_		
Cell2 timing offset to cell1	μS	3	Synchronous EN-DC
Cell3 timing offset to cell2	μS	3	Synchronous cells
T1	s	[0.2]	
T2	S	[0.2]	
T3	S	[0.2]	

Table A.5.5.6.1.2.1-3: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC

Parameter	Unit	Cell 2	Cell 3
Frequency Range		FF	R2
Duplex mode		Т	DD .
TDD configuration		TDDC	onf.3.1
BW <sub>channel</sub>		100 MHz:	N <sub>RB,c</sub> = 66
Active BWP ID		1, 2	0
Initial DL BWP Configuration		DLBWP.0.2	DLBWP.0.2
Active DL BWP-0 Configuration		NA	DLBWP.0.2
Active DL BWP-1 Configuration		DLBWP.1.3	NA
Active DL BWP-2 Configuration		DLBWP.1.1	NA
Initial UL BWP Configuration		ULBWP.0.2	ULBWP.0.2
Active UL BWP-0 Configuration		NA	ULBWP.0.2
Active UL BWP-1 Configuration		ULBWP.1.3	NA
Active UL BWP-2 Configuration		ULBWP.1.1	NA
PDSCH Reference measurement channel		SR.3.	1 TDD
RMSI CORESET parameters		CR.3.	1 TDD
Dedicated CORESET parameters		CCR.3.1 TDD	
OCNG Patterns		OP.1	
SSB Configuration		SSB.1 FR2	
SMTC Configuration		SMTC.1	
TCI State		TRS.2.1 TDD	
TRS Configuration		TCI.S	tate.0
Antenna Configuration		1:	<b>k</b> 2
Propagation Condition		AW	'GN
EPRE ratio of PSS to SSS	dB	0	0
EPRE ratio of PBCH DMRS to SSS	1		
EPRE ratio of PBCH to PBCH DMRS	]		
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH	]		
EPRE ratio of OCNG DMRS to SSS(Note 1)			
EPRE ratio of OCNG to OCNG DMRS (Note 1)			

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

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

Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3.

Table A.5.5.6.1.2.1-4: OTA related test parameters for DL BWP switch in synchronous EN-DC

Parameter	Unit	Cell 2	Cell 3
Angle of arrival configuration		According to clause A.3.15	According to clause A.3.15
Noc <sup>Note 1</sup>	dBm/15 kHz	-112	-112
SS-RSRP Note 2	dBm/120 kHz <sup>Note3</sup>	-85	-85
Ês/lot	dB	18	18
Io <sup>Note2</sup>	dBm/95.04 MHz <sup>Note4</sup>	-56	-56

- Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Nos to be fulfilled.
- Note 2: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the guiet zone
- Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone.

## A.5.5.6.1.2.2 Test Requirements

During T1, the UE shall start to send the ACK for PSCell in the DL slot right after slot  $(i+T_{BWPswitchDelay}+kI)$ .

During T3, the UE shall start to send the ACK for PSCell in the DL slot right after slot  $(j+T_{BWPswitchDelay}+kI)$ .

All of the above test requirements shall be fulfilled in order for the observed PSCell active BWP switch delay to be counted as correct.

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

During T1, the start of the interruption of PCell during PSCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start of the interruption of PCell during PSCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of PCell shall not be longer than the interruption duration specified for active BWP switch in TS36.133 Clause 7.32.2.7.

During T1, the start of the interruption of SCell during PSCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start of the interruption of SCell during PSCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of SCell shall not be longer than the interruption duration specified for active BWP switch in Clause 8.6.2.

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch interruption to be counted as correct.

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

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK in the DL slot right after slot  $(i+T_{BWPswitchDelay}+kI)$ ,  $(j+T_{BWPswitchDelay}+kI)$ , then the UE shall use the next available uplink resource for reporting the corresponding ACK.

Editor's note: FFS value of k1 for type 1 and type 2 UE.

# A.5.5.6.2 RRC-based Active BWP Switch

A.5.5.6.2.1 E-UTRAN – NR PSCell FR2 DL active BWP switch with non-DRX in synchronous EN-DC

# A.5.5.6.2.1.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement for RRC-based BWP switch defined in clause 8.6.3. Supported test configurations are shown in Table A.5.5.6.2.1.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1) and one NR PSCell (Cell 2) as given in Table A.5.5.6.2.1.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of NR PSCell are specified in Table A.5.5.6.2.1.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

Before the test starts.

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC) and to Cell 2 (PSCell) on radio channel 2 (PSCC).
- UE has bandwidth part BWP-1 in its RRC-configuration for Cell 2 (PSCell).
- UE is indicated in firstActiveDownlinkBWP-Id that the active DL BWP is BWP-1 in PSCell.

All cells have constant signal levels throughout the test.

The test consists of 1 time period, with duration of T1.

During T1,

Time period T1 starts when a *RRCReconfiguration* with updated bandwidth part configuration, sent from the test equipment to the UE, is received at the UE side in PSCell's slot # denoted i. The UE shall reconfigure its bandwidth part with the updated bandwidth part configuration.

The UE shall be able to completely receive PDSCH at the beginning of the DL slot right after PSCell's DL slot  $(i+T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC})$  as defined in clause 8.6.3 and be ready for the reception of uplink grant for the PSCell no later than at the beginning of the DL slot right after slot  $(i+T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC})$ . The UE shall be continuously scheduled on PSCell's BWP-1 starting from the beginning of the DL slot right after slot  $(i+T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC})$ .

 $T_{RRCprocessingDelay}$  and  $T_{BWPswitchDelayRRC}$  are defined in clause 8.6.3.

The test equipment verifies the DL BWP switch time in PSCell by counting the time from the time when the RRC Reconfiguration message including updated BWP configuration is sent till the time when RRC Reconfiguration Complete message is received.

Table A.5.5.6.2.1.1-1: DL BWP switch supported test configurations

Config	Description		
1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode		
2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode		
Note 1: The UE is only required to be tested in one of the supported test configurations			

Table A.5.5.6.2.1.1-2: General test parameters for DL BWP switch in synchronous EN-DC

Parameter	Unit	Value	Comment
E-UTRA RF Channel		4	One E-UTRA radio channel is used for this
Number		<b>'</b>	test
NR RF Channel Number		2	One NR radio channel is used for this test
Active PCell		Cell 1	PCell on RF channel number 1.
Active PSCell		Cell 2	PSCell on RF channel number 2.
CP length		Normal	
DRX		OFF	
Cell-individual offset for cells	dB	0	Individual offset for cells on PCC.
on RF channel number 1	uБ	O O	
Cell-individual offset for cells	dB	0	Individual offset for cells on PSCC.
on RF channel number 2	ub	0	
Cell2 timing offset to cell1	μS	3	Synchronous EN-DC
T1	S	[0.2]	

Table A.5.5.6.2.1.1-3: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC

Parameter			Unit	Cell 2	
Frequency R	Frequency Range			FR2	
Duplex mode				TDD	
TDD configuration				TDDConf.3.1	
BW <sub>channel</sub>				100 MHz: N <sub>RB,c</sub> = 66	
Active BWP I	D			1, 2	
Initial DL BW	P Configuration			DLBWP.0.2	
	P Configuration			ULBWP.0.2	
Initial Conditi	<u> </u>	BWP-1		DLBWP.1.3	
	Configura				
	Active UL	BWP-1		ULBWP.1.3	
	Configura	tion			
Final	Active DL			DLBWP.1.1	
Condition	Configura				
	Active UL			ULBWP.1.1	
	Configura				
	rence measuremen	t channel		SR.3.1 TDD	
	SET parameters			CR.3.1 TDD	
	DRESET parameters	S		CCR.3.1 TDD	
OCNG Patter				OP.1	
SSB Configu				SSB.1 FR2	
SMTC Config	juration			SMTC.1	
TCI State				TCI.State.0	
TRS Configuration				TRS.2.1 TDD	
Antenna Configuration				1x2	
	Propagation Condition			AWGN	
EPRE ratio of PSS to SSS			dB	0	
	EPRE ratio of PBCH DMRS to SSS				
	EPRE ratio of PBCH to PBCH DMRS EPRE ratio of PDCCH DMRS to SSS				
	PDCCH DMRS to SSS PDCCH to PDCCH DM				
	PDSCH DMRS to SSS				
	PDSCH to PDSCH				
	OCNG DMRS to SSS(	Note 1)			
	OCNG to OCNG DMR				
			h cells are full	y allocated and a constant	
tot	al transmitted powe	r spectral de	nsity is achiev	red for all OFDM symbols.	
Note 2: Int	erference from othe	r cells and n	oise sources r	not specified in the test is	
assumed to be constant over sub			arriers and tim	ne and shall be modelled	
as	AWGN of appropria	ite power for	Noc to be fulfi	lled.	
	e 3: SS-RSRP and lo levels have bee				
	information purposes. They are not settable parameters themselves.				
Note 4: For unpaired spectrum, a DL BWP is linke					
	inked with ULBWP.		•		
	BWP.1.3 is linked w	ith ULBWP.	1.3 defined in	clause 12 of	
TS	38.213 [3].				

Table A.5.5.6.2.1.1-4: OTA related test parameters for BWP switching test case

	Parameter	Unit	Cell 2
Angle of arrival	configuration		According to table A.3.15
	NR_TDD_FR2_A		
$N_{oc}^{\rm Note1}$	NR_TDD_FR2_B	dDre /45kl	440
	NR_TDD_FR2_F	dBm/15kHz	-112
	NR TDD FR2 G		

		NR_TDD_FR2_T				
		NR_TDD_FR2_Y				
		NR_TDD_FR2_A				
		NR_TDD_FR2_B				
$N_{oc}^{ m Note1}$		NR_TDD_FR2_F	dBm/SCS	-103		
		NR_TDD_FR2_G	ubiii/scs	-103		
		NR_TDD_FR2_T				
		NR_TDD_FR2_Y				
		NR_TDD_FR2_A				
		NR_TDD_FR2_B				
SS-RSRF	Note2	NR_TDD_FR2_F	dBm/SCS	-85		
30-110111		NR_TDD_FR2_G	Note3	-05		
		NR_TDD_FR2_T				
		NR_TDD_FR2_Y				
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$			dB	18		
		NR_TDD_FR2_A				
		NR_TDD_FR2_B				
IoNote2		NR_TDD_FR2_F	dBm/95.04	-56		
10.10102		NR_TDD_FR2_G	MHz Note4	-56		
		NR_TDD_FR2_T				
		NR_TDD_FR2_Y				
Note 1:	Interference	e from other cells and i	noise sources no	ot specified in the test is		
	assumed t	o be constant over sub	carriers and time	e and shall be modelled as		
AWGN of appropriate power for $N_{oc}$ to be fulfilled.						
Note 2:	Note 2: SS-RSRP and lo levels have been derived from other parameters for					
		n purposes. They are no		•		
Note 3: SS-RSRP minimum requirements are specified assuming independent						
interference and noise at each receiver antenna port.						
Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone						

# A.5.5.6.2.1.2 Test Requirements

During T1, the UE shall be ready for the reception of uplink grant for PSCell in the beginning of the DL slot right after slot ( $i+T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC}$ ).

All of the above test requirements shall be fulfilled in order for the observed PSCell active BWP switch delay to be counted as correct.

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

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

# A.5.5.7 PSCell addition and release delay

# A.5.5.7.1 Addition and Release Delay of NR PSCell

# A.5.5.7.1.1 Test purpose and environment

The purpose of this test is to verify that the NR PSCell addition and release delays under EN-DC are within the requirements stated in clause 7.31.2 of TS 36.133 [15] for the case when the PSCell is unknown by the UE at the time of addition.

Supported test configurations are shown in A.5.5.7.1.1-1. The test parameters for the E-UTRA cell are given in Table A.3.7.2.1-1. The E-UTRA cell once set up is not changed across time.

The test parameters for NR cell are given in Tables A.5.5.7.1.1-2, cell-specific parameters in A.5.5.7.1.1-3 and OTA parameters in A.5.5.7.1.1-4 below. The test consists of four successive time periods with duration of T1, T2, T3 and T4. There are two carriers each with one cell. Before the test starts the UE is connected to Cell 1 (E-UTRA PCell) on radio channel 1 (PCC) but is not aware of Cell 2 (NR PSCell) on radio channel 2. The UE is only monitoring the PCC. During T1 only Cell1 is known to the UE.

The test system shall send a RRC message to the UE to add PSCell (Cell 2) on radio channel 2. The RRC message (to add PSCell) also includes a request for the UE to start periodic CSI reporting for the PSCell after the PSCell has been successfully added. The RRC message to add PSCell shall be sent to the UE during period T1. The point in time at which the RRC message to add PSCell (Cell2) is received at the UE antenna connector defines the start of period T2.

The test system shall observe the periodic reporting of CSI for PSCell during T3. The point in time at which the UE has sent PRACH to the PSCell (Cell 2) defines the start of period T3.

The test system shall send a RRC message to the UE to release PSCell (Cell 2) on radio channel 2. The RRC message to release PSCell (Cell2) shall be sent to the UE during period T3, after the UE has sent at least one CQI report with non-zero CQI index for PSCell (Cell 2). The point in time at which the RRC message to release PSCell (Cell2) is received at the UE antenna connector defines the start of period T4.

Table A.5.5.7.1.1-1: Supported test configurations for FR2 PSCell

Configuration	Description	
1	LTE FDD, NR TDD, SSB SCS 240 kHz, data SCS 120 kHz, BW 100 MHz	
2	LTE TDD, NR TDD, SSB SCS 240 kHz, data SCS 120 kHz, BW 100 MHz	
Note: The UE is only required to be tested in one of the supported test configurations		

Table A.5.5.7.1.1-2: General Test Parameters for PSCell Addition and Release

Parameter		Unit	Value	Comment
RF Channel Number			1, 2	Two radio channels are used for this test. One for E-UTRA cell and second for NR Cell
Initial	Active PCell		Cell1	PCell on RF channel number 1.
Condition	Neighbour cell		Cell2	Neighbour cell on RF channel number 2.
Final	Active PCell		Cell1	PCell on RF channel number 1.
Condition	Neighbour Cell		Cell2	PSCell released on RF channel number 2.
B1	Hysteresis	dB	0	Hysteresis for evaluation of event B1.
	Threshold	dBm	100	Actual RSRP threshold for event B1. Needs to
	RSRP			take absolute accuracy tolerance in clause
				9.1.11.1 into account plus margin.
	Time to Trigger	S	0	
DRX			OFF	Continuous monitoring of primary cell
PRACH configuration on cell2			FR2 configuration 2	Captured in A.3.8.3.2
CQI/PMI periodicity and offset configuration index on cell2			TBD	CQI reporting for PSCell every uplink subframe
	Cell-individual offset for cells on RF channel number 1		0	Individual offset for cells on primary component carrier.
Cell-individual	offset for cells on umber 2	dB	0	Individual offset for cells on carrier frequency of cell2.
T1		s	1	During this time the PCell shall be known and cell2 shall be unknown.
T2		s	1	During this time the UE adds the PSCell.
Т3		s	1	During this time the UE sends CSI reports for PSCell.
T4		s	1	During this time the UE releases the PSCell.

Table A.5.5.7.1.1-3: Cell Specific Parameters for PSCell Addition and Release

Parameter	Unit	Unit Confin		Test		
	Unit	Config	T1	T2	T3	T4
E-UTRA Channel		1,2		1		
Number		· ·				
NR Channel Number		1,2		2		
Duplex Mode		1,2		TDD		
TDD configuration		1,2		TDDCon		
BW <sub>channel</sub>	MHz	1,2	10	0: NRB,		
Initial BWP		1,2		DLBWP		
Configuration		,		ULBWP		
Dedicated BWP		1,2		DLBWP		
Configuration		· ·		ULBWP		
TRS Configuration		1		TRS.2.1		
TCI State		1	C	SI-RS.Co	nfig.0	
PDSCH Reference		1,2		SR.3.1 T	מח.	
measurement channel		1,2		511.5.1	טט	
RMSI CORESET		1,2		CR.3.1 7	מם:	
Reference Channel		1,2		011.0.1		
Dedicated CORESET		1,2		CCR.3.1	TDD	
Reference Channel			· ·			
OCNG Patterns		1,2	OP.1			
SSB configuration		1,2		SSB.1 F		
SMTC configuration		1,2		SMTC		
TRS Configuration		1,2		TRS.2.1	TDD	
EPRE ratio of PSS to						
SSS						
EPRE ratio of PBCH						
DMRS to SSS EPRE ratio of PBCH to						
PBCH DMRS						
EPRE ratio of PDCCH						
DMRS to SSS						
EPRE ratio of PDCCH						
to PDCCH DMRS	dB	1,2		0		
EPRE ratio of PDSCH	d D	٠,٠		J		
DMRS to SSS						
EPRE ratio of PDSCH						
to PDSCH						
EPRE ratio of OCNG						
DMRS to SSS(Note 1)						
EPRE ratio of OCNG						
to OCNG DMRS (Note						
1)						
Propagation condition		1,2		AWGI	N	

Table A.5.5.7.1.1-4: OTA related test parameters

Parameter	Unit	Test				
Angle of arrival configuration		Setup 2a according to clause A.3.15.2.1				
$N_{oc}^{}$ Note1	dBm/15kHz <sup>Note4</sup>	TBD				
$N_{oc}$ Note1	dBm/SCS <sup>Note3</sup>	TBD				
$\hat{E}_s/N_{oc}$	dB	TBD				
SS-RSRP <sup>Note2</sup>	dBm/SCS Note4	TBD				
$\hat{E}_{s}/I_{ot}$	dB	TBD				
Io <sup>Note2</sup>	dBm/95.04 MHz Note4	TBD				
Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power.						
for $N_{oc}$ to be fulfille	for $N_{ac}$ to be fulfilled.					
Note 2: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.						
Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.						
	Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone					

# A.5.5.7.1.2 Test Requirements

The UE shall transmit the PRACH to PSCell at latest 582 ms<sup>Note1</sup> into T2.

The UE shall send at least one CSI report for PSCell with non-zero CQI index during T4.

The UE shall periodically send CSI reports for PSCell after the UE has sent first CQI report with non-zero CQI index during T4

The UE shall stop sending CSI reports for PSCell in at latest [20] ms into T5.

All the above test requirements shall be fulfilled for the observed PSCell addition delay and PSCell release delay to be counted as correct. The rate of correct observed PSCell addition delay and PSCell release delay during repeated tests shall be at least 90%.

Note1: The PSCell addition delay can be expressed as follows as specified in clause 7.31.2 of TS 36.133 [15]:

$$T_{config\_PSCell} = T_{RRC\_delay} + T_{processing} + T_{search} + T_{\Delta} + T_{PSCell\_DU} + 2ms$$

Where:

 $T_{RRC\ delay} = 20ms$ 

 $T_{processing} = 40 \text{ms}$ 

 $T_{search} = 8*3*20 = 480 \text{ ms}$ 

 $T_{\Delta} = 20ms$ 

 $T_{PSCell\_DU} = 1*10+10 = 20 \text{ ms}$ 

# A.5.5.8 Active TCI state switch delay

# A.5.5.8.1 MAC-CE based active TCI state switch

### A.5.5.8.1.1 E-UTRAN – NR PSCell FR2 active TCI state switch for a known TCI state

### A.5.5.8.1.1.1 Test Purpose and Environment

The purpose of this test is to verify the active TCI state switch delay requirement defined in clause 8.10.3Supported test configurations are shown in Table A.5.5.8.1.1.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1), and one NR PSCell (Cell 2) as given in Table A.5.5.8.1.1.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of NR PSCell is specified in Table A.5.5.8.1.1.1-3 below. The OTA related test parameters for FR2 is shown in Table A.5.5.8.1.1.1-4.

PDCCHs indicating new transmissions shall be sent continuously on PSCell (Cell 2) to ensure that the UE would have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), and Cell 2 (PSCell) on radio channel 2 (PSCC).
- UE is configured with 2 different TCI states for PSCell, PDCCH TCI state 0 (QCL'd to SSB0) and TCIstate 1 (QCL'd to SSB1), in Cell 2 before starting the test.
- UE is indicated in TCI state 0 as the active PDCCH TCI state

The test consists of two time periods, T1 and T2. During T1 only SSB to which PDCCH-TCI-state0 is QCL'd is transmitted. At the beginning of T2, the SSB corresponding to TCI state 1 starts transmitting. The is UE configured to provide periodic L1-RSRP reports. In slot n which is within 1280ms of UE providing L1-RSRP report with results for both SSB0 and SSB1, UE receives a MAC-CE command indicating a switch to TCI state 1.

The test equipment verifies that UE can be scheduled on PSCell on TCI state 0 till n+  $T_{HARQ}$  +3 ms +  $T_{first-SSB}$ . The test equipment also verifies the TCI state switch time in PSCell by scheduling the UE on TCI state 1 after n+  $T_{HARQ}$  +3 ms +  $(T_{first-SSB} + T_{SSB-proc})$ .

Table A.5.5.8.1.1.1-1: Supported test configurations

	Config	Description
1		LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2		LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note 1:	The UE is only re	equired to be tested in one of the supported test configurations

Table A.5.5.8.1.1.1-2: General test parameters for TCI state switch

Parameter	Unit	Value	Comment
E-UTRA RF Channel		4	One E-UTRA radio channel is used for this
Number		I	test
NR RF Channel Number		2	One NR radio channel is used for this test
Active PCell		Cell 1	PCell on RF channel number 1.
Active PSCell		Cell 2	PSCell on RF channel number 2.
CP length		Normal	
DRX		OFF	For both PCell and PSCell
Cell-individual offset for cells on RF channel number 1	dB	0	Individual offset for cells on PCC.
Cell-individual offset for cells on RF channel number 2	dB	0	Individual offset for cells on PSCC.
Cell2 timing offset to cell1	μS	3	Synchronous EN-DC
T1	S	[0.2]	
T2	S	[0.2]	

Table A.5.5.8.1.1.1-3: NR Cell specific test parameters for TCI state switch

Parameter	Unit	Cell 2		
Frequency Range		FR2		
Duplex mode		TDD		
TDD configuration		TDDConf.3.1		
BW <sub>channel</sub>		100 MHz: N <sub>RB,c</sub> = 66		
Initial DL BWP Configuration		DLBWP.0.2		
Dedicated DL BWP Configuration		DLBWP.1.1		
Initial UL BWP Configuration		ULBWP.0.2		
Dedicated UL BWP Configuration		ULBWP.1.1		
PDSCH Reference measurement channel		SR.3.1 TDD		
RMSI CORESET parameters		CR.3.1 TDD		
Dedicated CORESET parameters		CCR.3.1 TDD		
OCNG Patterns		OP.1		
SSB Configuration		SSB.1 FR2		
SMTC Configuration		SMTC.1		
TCI State 0		TC. State.0		
TCI State 1		TCI.State.1		
TRS Configuration		TRS.2.1 TDD		
Correlation Matrix and Antenna		1x2 Low		
Configuration				
EPRE ratio of PSS to SSS	dB	0		
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS(Note 1)				
EPRE ratio of OCNG to OCNG DMRS (Note				
1)				
Propagation Condition		AWGN		
Note 1: OCNG shall be used such that both cells are fully allocated and a constant				

total transmitted power spectral density is achieved for all OFDM symbols.

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Unit Cell 2 **Parameter** SSB0 SSB<sub>1</sub> T1 T2 T1 **T2** Angle of arrival Setup 3 According to clause A.3.15.3 configuration N<sub>oc</sub>Note 1 dBm/15 kHz [-92.1] Noc<sup>Note 1</sup> dBm/SCS [-83.1] Ês/Noc dΒ 1 -Infinity SS-RSRP Note 2 dBm/120 kHz Note3 -82.1 -82.1 -82.1 -Infinity

Table A.5.5.8.1.1.1-4: OTA related test parameters for TCI state switch

dBm/95.04 MHz Note4 Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.

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-54.94

-54.94

SS-RSRP and lo levels have been derived from other parameters for Note 2: information purposes. They are not settable parameters themselves.

SS-RSRP minimum requirements are specified assuming independent Note 3: interference and noise at each receiver antenna port.

Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone

Note 5: As observed with 0dBi gain antenna at the center of the guiet zone.

#### A.5.5.8.1.1.2 **Test Requirements**

Io<sup>Note2,Note6</sup>

During T2, UE shall send L1-RSRP report with results for both SSB0 and SSB1.

After receiving MAC-CE command in slot n, UE shall:

- be able to continue to receive on TCI state 0 till n+ T<sub>HARO</sub> +3 ms + T<sub>first-SSR</sub>
- be able to start receiving on TCI state 1 after n+ T<sub>HARO</sub> +5 ms +TO<sub>k</sub>\*T<sub>first-SSB</sub>

#### A.5.5.8.2 RRC based active TCI state switch

#### E-UTRAN – NR PSCell FR2 active TCI state switch for a known TCI state A.5.5.8.2.1

#### A.5.5.8.2.1.1 Test Purpose and Environment

The purpose of this test is to verify the active TCI state switch delay requirement defined in clause 8.10.3Supported test configurations are shown in Table A.5.5.8.2.1.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1), and one NR PSCell (Cell 2) as given in Table A.5.5.8.2.1.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of NR PSCell is specified in Table A.5.5.8.2.1.1-3 below. The OTA related test parameters for FR2 is shown in Table A.5.5.8.2.1.1-4.

PDCCHs indicating new transmissions shall be sent continuously on PSCell (Cell 2) to ensure that the UE would have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), and Cell 2 (PSCell) on radio channel 2 (PSCC).
- UE is configured with 1 TCI state for PSCell, PDCCH-TCI-state0 (QCL'd to SSB0)
- UE is indicated in TCI state0 as the active TCI state

The test consists of two time periods, T1 and T2. During T1 only SSB to which TCI-state0 is QCL'd is transmitted. At the beginning of T2, the SSB corresponding to TCI-state0 starts transmitting. The is UE configured to provide periodic L1-RSRP reports. In slot n which is within 1280 ms of UE providing L1-RSRP report with results for both SSB0 and SSB1, UE receives a RRC command indicating a switch to TCI-state1.

The test equipment verifies the TCI state switch time in PSCell by scheduling the UE on TCI state 1 after n+  $T_{RRC\_processing} + T_{first-SSB} + 2ms$ .

Table A.5.5.8.2.1.1-1: Supported test configurations

	Config	Description
1		LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2		LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note 1:	The UE is only r	equired to be tested in one of the supported test configurations

Table A.5.5.8.2.1.1-2: General test parameters for TCI state switch

Parameter	Unit	Value	Comment
E-UTRA RF Channel	E-UTRA RF Channel		One E-UTRA radio channel is used for this
Number		'	test
NR RF Channel Number		2	One NR radio channel is used for this test
Active PCell		Cell 1	PCell on RF channel number 1.
Active PSCell		Cell 2	PSCell on RF channel number 2.
CP length		Normal	
DRX		OFF	For both PCell and PSCell
Cell-individual offset for cells on RF channel number 1	dB	0	Individual offset for cells on PCC.
Cell-individual offset for cells on RF channel number 2	dB	0	Individual offset for cells on PSCC.
Cell2 timing offset to cell1	μS	3	Synchronous EN-DC
T1	S	[0.2]	
T2	s	[0.2]	

Table A.5.5.8.2.1.1-3: NR Cell specific test parameters for TCI state switch

Parameter	Unit	Cell 2			
Frequency Range		FR2			
Duplex mode		TDD			
TDD configuration		TDDConf.3.1			
BW <sub>channel</sub>		100 MHz: N <sub>RB,c</sub> = 66			
Initial DL BWP Configuration		DLBWP.0.2			
Dedicated DL BWP Configuration		DLBWP.1.1			
Initial UL BWP Configuration		ULBWP.0.2			
Dedicated UL BWP Configuration		ULBWP.1.1			
PDSCH Reference measurement channel		SR.3.1 TDD			
RMSI CORESET parameters		CR.3.1 TDD			
Dedicated CORESET parameters		CCR.3.1 TDD			
OCNG Patterns		OP.1			
SSB Configuration		SSB.1 FR2			
SMTC Configuration		SMTC.1			
TCI State 0		TC. State.0			
TCI State 1		TCI.State.1			
TRS Configuration		TRS.2.1 TDD			
Correlation Matrix and Antenna		1x2 Low			
Configuration					
EPRE ratio of PSS to SSS	dB	0			
EPRE ratio of PBCH DMRS to SSS					
EPRE ratio of PBCH to PBCH DMRS					
EPRE ratio of PDCCH DMRS to SSS					
EPRE ratio of PDCCH to PDCCH DMRS					
EPRE ratio of PDSCH DMRS to SSS					
EPRE ratio of PDSCH to PDSCH					
EPRE ratio of OCNG DMRS to SSS(Note 1)					
EPRE ratio of OCNG to OCNG DMRS (Note					
1)					
Propagation Condition		AWGN			
Note 1: OCNG shall be used such that both cells are fully allocated and a constant					

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

Unit

**Parameter** 

Table A.5.5.8.2.1.1-4: OTA related test parameters for TCI state switch

Cell 2

			SSI	B0	SS	SB1	
			T1	T2	T1	T2	
Angle of	arrival		Setup	3 According	g to clause /	A.3.15.3	
configura	tion						
Noc <sup>Note 1</sup>		dBm/15 kHz		[-9	2.1]		
Noc <sup>Note 1</sup>		dBm/SCS		3-]	3.1]		
Ês/Noc		dB	1	1	-Infinity	1	
SS-RSRF		dBm/120 kHz Note3	-82.1	-82.1	-Infinity	-82.1	
Io <sup>Note2,Note</sup>	e6	dBm/95.04 MHz Note4	-54.9	-54.9	-54.9	-54.9	
Note 1:		nce from other cells and					
	assume	d to be constant over sub	carriers and	time and s	shall be mod	lelled as	
		of appropriate power for N					
Note 2:		RP and Io levels have bee		•			
		ion purposes. They are n					
Note 3: SS-RSRP minimum requirement					g independ	ent	
interference and noise at each receiver antenna port.							
Note 4: Equivalent power received by an			antenna wit	h 0 dBi gai	n at the cen	tre of the	
	quiet zone						
Note 5:	As obse	rved with 0dBi gain anten	ına at the ce	nter of the	quiet zone.		

# A.5.5.8.2.1.2 Test Requirements

During T2, UE shall send L1-RSRP report with both SSB0 and SSB1.

After receiving RRC command in slot n, UE shall be able to start receiving on TCI state 1 after n+  $T_{RRC\_processing}$  +  $T_{first-SSB}$  + 2ms.

# A.5.6 Measurement procedure

# A.5.6.1 Intra-frequency Measurements

# A.5.6.1.1 EN-DC event triggered reporting test without gap under non-DRX

# A.5.6.1.1.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the TDD intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2. Supported test configurations are shown in table A.5.6.1.1.1-1.

Table A.5.6.1.1.1-1: supported test configurations

	Configuration	Description
1		LTE FDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2		LTE TDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
3		LTE FDD, 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
4		LTE TDD, 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note:	The UE is only re	equired to be tested in one of the supported test configurations.

There are three cells in the test, E-UTRAN PCell (Cell 1), FR2 PSCell (Cell 2) and a FR2 neighbour cell (Cell 3) on the same frequency as the PSCell. The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 and Cell 3 are given in Table A.5.6.1.1.1-2, A.5.6.1.1.1-3 and A.5.6.1.1.1-4 below.

In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

Table A.5.6.1.1.1-2: General test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 without gap without DRX

Parameter	Unit	Config	Value	Comment
Active cell			E-UTRAN	
		1~4	PCell (Cell 1)	
		11-54	PSCell (Cell	
			2)	
Neighbour cell		1~4	Cell 3	Cell to be identified.
RF Channel Number			1: Cell 1	One TDD carrier frequency is used for the NR cells
		1~4	2: Cell 2 and	and one TDD or FDD carrier frequency is used for E-
			Cell 3	UTRAN cell.
SMTC configuration		1~4	SMTC.1	
A3-Offset	dB	1~4	-6	
CP length		1~4	Normal	
Hysteresis	dB	1~4	0	
Time To Trigger	S	1~4	0	
Filter coefficient		1~4	0	L3 filtering is not used
DRX		1~4	OFF	
Time offset between		1~4	3 μs	Synchronous EN-DC
Cell 1 and Cell 2		1~4		
Time offset between		1~4	3 μs	Synchronous cells
Cell 2 and Cell 3		1174		
T1	S	1~4	5	
T2	s	1~4	5	

Table A.5.6.1.1.1-3: NR Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 without gap without DRX

Parameter	Unit	Config	Cel	Cell 2 T1 T2		II 3
			T1			T2
TDD configuration		1~4	TDDC	nf.3.1	TDDC	onf.3.1
Intial BWP		1~4	DLBW	P.0.1	DLBW	/P.0.1
configuration			ULBW	P.0.1	ULBW	/P.0.1
Active DL BWP		1~4	DLBW	P.1.1	DLBW	/P.1.1
configuration						
Active UL BWP		1~4	ULBW	P.1.1	ULBW	/P.1.1
configuration						
RLM-RS		1~4	SS	В	SS	SB
PDSCH RMC		1~4	SR.3.1	SR.3.1 TDD		/A
configuration						
RMSI CORESET		1~4	CR.3.1	CR.3.1 TDD		1 TDD
RMC						
configuration						
Dedicated		1~4	CCR.3.	CCR.3.1 TDD		.1 TDD
CORESET RMC						
configuration						
OCNG Patterns		1~4	OF		OF	
TRS configuration		1~4	TRS.2.	TRS.2.1 TDD		/A
PDSCH/PDCCH		1~4	TCI.S	TCI.State.2		/A
TCI state						
SSB configuration		1, 2	SSB.1 FR2 SSB.1 FF		1 FR2	
		3, 4	SSB.2 FR2 SSB.2		2 FR2	
Propagation		1~4		A۷	VGN	
Condition						

Table A.5.6.1.1.1-4: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 without gap without DRX

Parameter	Unit	Config	Ce	II 2	Ce	II 3
			T1	T2	T1	T2
AoA setup		1~4	S	etup 3 defii	ned in A.3.1	5.3
$\hat{E}_{s}/I_{ot}$	dB	1~4	4	4	-Infinity	8
$N_{oc}$ Note 2	dBm/15 KHz	1~4		_	102	
Note 2	dBm/SCS	1, 2	-93			
1 oc		3, 4			90	
SS-RSRP	dBm/SCS	1, 2	-89	-89	-Infinity	-85
		3, 4	-86	-86	-Infinity	-82
$\hat{E}_s/N_{oc}$	dB	1~4	4	4	-Infinity	8
Io	dBm/95.04MHz	1~4		or AoA1; for AoA2	-58.56 fo -55.38 f	,

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

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

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

# A.5.6.1.1.2 Test Requirements

In the test, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 2.4s for a UE supporting power class 1,
- 1.44s for a UE supporting power class 2, 3 and 4

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.5.6.1.2 EN-DC event triggered reporting test without gap under DRX

# A.5.6.1.2.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the TDD intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2. Supported test configurations are shown in table A.5.6.1.2.1-1.

Table A.5.6.1.2.1-1: supported test configurations

Configuration	Description	
1	LTE FDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode	
2	LTE TDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode	
3	LTE FDD, 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode	
4	LTE TDD, 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode	
Note: The UE is only required to be tested in one of the supported test configurations.		

There are three cells in the test, E-UTRAN PCell (Cell 1), FR2 PSCell (Cell 2) and a FR2 neighbour cell (Cell 3) on the same frequency as the PSCell. The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 and Cell 3 are given in Table A.5.6.1.2.1-2 ~ Table A.5.6.1.2.1-6 below.

In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

Table A.5.6.1.2.1-2: General test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 without gap with DRX

Parameter	Unit	Config	Value		Comment
			Test 1	Test 2	
Active cell		1~4	E-UTRAN F	PCell (Cell 1)	
		11-4	PSCell (Cel	II 2)	
Neighbour cell		1~4	Cell 3		Cell to be identified.
RF Channel Number			1: Cell 1		One TDD carrier frequency is used for the NR
		1~4	2: Cell 2 an	d Cell 3	cells and one TDD or FDD carrier frequency is
					used for E-UTRAN cell.
SMTC configuration		1~4	SMTC.1		
A3-Offset	dB	1~4	-6		
CP length		1~4	Normal		
Hysteresis	dB	1~4	0		
Time To Trigger	s	1~4	0		
Filter coefficient		1~4	0		L3 filtering is not used
DRX		1~4	DRX.1	DRX.2	DRX related parameters are defined in Table A.5.6.1.2.1-4
Time offset between Cell 1 and Cell 2		1~4	3 μs		Synchronous EN-DC
Time offset between		1~4	3 μs		Synchronous cells
Cell 2 and Cell 3		1:=4			
T1	s	1~4	5		
T2	s	1~4	10	52	

Table A.5.6.1.2.1-3: NR Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 without gap with DRX

Parameter	Unit	Config	Cell 2		Cell 3	
			T1	T2	T1	T2

TDD configuration	1~4	TDDConf.3.1	TDDConf.3.1
Intial BWP	1~4	DLBWP.0.1	DLBWP.0.1
configuration		ULBWP.0.1	ULBWP.0.1
Active DL BWP	1~4	DLBWP.1.1	DLBWP.1.1
configuration			
Active UL BWP	1~4	ULBWP.1.1	ULBWP.1.1
configuration			
RLM-RS	1~4	SSB	SSB
PDSCH RMC	1~4	SR.3.1 TDD	N/A
configuration			
RMSI CORESET	1~4	CR.3.1 TDD	CR.3.1 TDD
RMC			
configuration			
Dedicated	1~4	CCR.3.1 TDD	CCR.3.1 TDD
CORESET RMC			
configuration			
OCNG Patterns	1~4	OP.1	OP.1
PDSCH/PDCCH	1~4	TCI.State.2	N/A
TCI state			
TCI state	1~4	CSI-RS.Config.0	N/A
SSB configuration	1, 2	SSB.1 FR2	SSB.1 FR2
	3, 4	SSB.2 FR2	SSB.2 FR2
Propagation	1~4	AV	VGN
Condition			

Table A.5.6.1.2.1-4: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 without gap with DRX

Parameter	Unit	Config	Ce	Cell 2		II 3	
			T1	T2	T1	T2	
AoA setup		1~4 Setup 1 defined in A.3.15					
$\hat{E}_{s}/I_{ot}$	dB	dB 1~4		4 -1.46 -Infinity		-1.46	
$N_{oc}$ Note 2	dBm/15 KHz	1~4	-98				
$N_{oc}$ Note 2	dBm/SCS	1, 2	-89				
1 oc		3, 4	-86				
SS-RSRP	dBm/SCS	1, 2	-85	-85	-Infinity	-85	
		3, 4	-82	-82	-Infinity	-82	
$\hat{E}_s/N_{oc}$	dB	1~4	4	4	-Infinity	4	
Io	dBm/95.04MHz	1, 2	-54.56	-52.21	-54.56	-52.21	

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2

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

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

# A.5.6.1.2.2 Test Requirements

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 7.2s for a UE supporting power class 1,
- 4.32s for a UE supporting power class 2, 3 and 4

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 51.2s for a UE supporting power class 1,
- 30.72s for a UE supporting power class 2, 3 and 4

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.5.6.1.3 EN-DC event triggered reporting test with per-UE gaps under non-DRX

# A.5.6.1.3.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the TDD intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2. Supported test configurations are shown in table A.5.6.1.3.1-1.

	Configuration	Description
1		LTE FDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2		LTE TDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
3		LTE FDD, 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
4		LTE TDD, 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note	The UE is only re	equired to be tested in one of the supported test configurations.

Table A.5.6.1.3.1-1: supported test configurations

There are three cells in the test, E-UTRAN PCell (Cell 1), FR2 PSCell (Cell 2) and a FR2 neighbour cell (Cell 3) on the same frequency as the PSCell. The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 and Cell 3 are given in Table A.5.6.1.3.1-2  $\sim$  4 below.

There are two BWPs configured in Cell 2, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 2. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

Table A.5.6.1.3.1-2: General test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 with per-UE gaps without DRX

Parameter	Unit	Config	Value	Comment
Active cell		1~4	E-UTRAN PCell (Cell 1) PSCell (Cell 2)	
Neighbour cell		1~4	Cell 3	Cell to be identified.
RF Channel Number		1~4	1: Cell 1 2: Cell 2 and Cell 3	One TDD carrier frequency is used for the NR cells and one TDD or FDD carrier frequency is used for E-UTRAN cell.
Gap type		1~4	Per-UE gaps	
Measurement gap repitition periodicity	ms	1~4	40	
Measurement gap length	ms	1~4	6	
Measurement gap offset	ms	1~4	39	
SMTC configuration		1~4	SMTC.1	
CSI-RS parameters		1~4	CSI-RS.3.2 TDD	
A3-Offset	dB	1~4	-6	
CP length		1~4	Normal	
Hysteresis	dB	1~4	0	
Time To Trigger	s	1~4	0	
Filter coefficient		1~4	0	L3 filtering is not used
DRX		1~4	OFF	
Time offset between Cell 1 and Cell 2		1~4	3 μs	Synchronous EN-DC
Time offset between Cell 2 and Cell 3		1~4	3 μs	Synchronous cells
T1	s	1~4	5	
T2	S	1~4	5	

Table A.5.6.1.3.1-3: NR Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 with per-UE gaps without DRX

Parameter	Unit	Config	Cell 2		Cell 3	
			T1	T2	T1	T2

TDD configuration	1~4	TDDConf.3.1	TDDConf.3.1
Intial BWP	1~4	DLBWP.0.1	DLBWP.0.1
configuration		ULBWP.0.1	ULBWP.0.1
Active DL BWP	1~4	DLBWP.1.2	DLBWP.1.1
configuration			
Active UL BWP	1~4	ULBWP.1.2	ULBWP.1.1
configuration			
RLM-RS	1~4	CSI-RS	SSB
PDSCH RMC	1~4	SR.3.1 TDD	N/A
configuration			
RMSI CORESET	1~4	CR.3.1 TDD	CR.3.1 TDD
RMC			
configuration			
Dedicated	1~4	CCR.3.1 TDD	CCR.3.1 TDD
CORESET RMC			
configuration			
TRS configuration	1~4	TRS.2.1 TDD	N/A
PDSCH/PDCCH	1~4	TCI.State.2	N/A
TCI state			
OCNG Patterns	1~4	OP.1	OP.1
SSB	1, 2	SSB.1 FR2	SSB.1 FR2
	3, 4	SSB.2 FR2	SSB.2 FR2
Propagation	1~4	AV	VGN
Condition			

Table A.5.6.1.3.1-4: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 with per-UE gaps without DRX

Parameter	Unit	Config	Ce	Cell 2		II 3	
			T1	T2	T1	T2	
AoA setup		1~4	1~4 Setup 3 defined in A.3.15.3				
$\hat{E}_{s}/I_{ot}$	dB	1~4	4	4	-Infinity	8	
$N_{oc}$ Note 2	dBm/15 KHz	1~4	-102				
Note 2	dBm/SCS	1, 2		-93			
1 oc		3, 4	-90				
SS-RSRP	dBm/SCS	1, 2	-89	-89	-Infinity	-85	
		3, 4	-86	-86	-Infinity	-82	
$\hat{E}_s/N_{oc}$	dB	3, 4	4	4	-Infinity	8	
Io	dBm/95.04MHz	1~4	-58.56 for AoA1; -58.56 for AoA2; -55.38 for AoA2			,	
					or Anaz		

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

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

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

# A.5.6.1.3.2 Test Requirements

In the test, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 3.2s for a UE supporting power class 1,
- 1.92s for a UE supporting power class 2, 3 and 4

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.5.6.1.4 EN-DC event triggered reporting test with per-UE gaps under DRX

# A.5.6.1.4.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the TDD intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2. Supported test configurations are shown in table A.5.6.1.4.1-1.

ConfigurationDescription1LTE FDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode2LTE TDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode3LTE FDD, 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode4LTE TDD, 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex modeNote:The UE is only required to be tested in one of the supported test configurations.

Table A.5.6.1.4.1-1: supported test configurations

There are three cells in the test, E-UTRAN PCell (Cell 1), FR2 PSCell (Cell 2) and a FR2 neighbour cell (Cell 3) on the same frequency as the PSCell. The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 and Cell 3 are given in Table A.5.6.1.4.1-2  $\sim$  6.

During the test, Cell 2 and Cell 3 are transmitted from the direction determined according to A3.8.

There are two BWPs configured in Cell 2, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 2. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

Table A.5.6.1.4.1-2: General test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 with per-UE gaps with DRX

Parameter	Unit	Config	Value		Comment
			Test 1	Test 2	

Active cell		1~4	E-UTRAN PCell (Cell 1) PSCell (Cell 2)		
Neighbour cell		1~4	Cell 3		Cell to be identified.
RF Channel Number		1~4	2: Cell 2 and Cell 3		One TDD carrier frequency is used for the NR cells and one TDD or FDD carrier frequency is used for E-UTRAN cell.
Gap type		1~4	Per-UE ga	aps	
Measurement gap repitition periodicity	ms	1~4	40		
Measurement gap length	ms	1~4	6		
Measurement gap offset	ms	1~4	39		
SMTC configuration		1~4	SMTC.1		
CSI-RS parameters		1~4	CSI-RS.3.	2 TDD	
A3-Offset	dB	1~4	-6		
CP length		1~4	Normal		
Hysteresis	dB	1~4	0		
Time To Trigger	s	1~4	0		
Filter coefficient		1~4	0		L3 filtering is not used
DRX		1~4	DRX.1	DRX.2	DRX related parameters are defined in Table A.5.6.1.4.1-5
Time offset between Cell 1 and Cell 2		1~4	3 μs		Synchronous EN-DC
Time offset between Cell 2 and Cell 3		1~4	3 μs		Synchronous cells
T1	s	1~4	5		
T2	S	1~4	10	52	

Table A.5.6.1.4.1-3: NR Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 with per-UE gaps with DRX

Parameter	Unit	Config	Cell 2	Cell 3
			T1 T2	T1 T2
TDD configuration		1~4	TDDConf.3.1	TDDConf.3.1
Intial BWP		1~4	DLBWP.0.1	DLBWP.0.1
configuration			ULBWP.0.1	ULBWP.0.1
Active DL BWP		1~4	DLBWP.1.2	DLBWP.1.1
configuration				
Active UL BWP		1~4	ULBWP.1.2	ULBWP.1.1
configuration				
RLM-RS		1~4	CSI-RS	SSB
PDSCH RMC		1~4	SR.3.1 TDD	N/A
configuration				
RMSI CORESET		1~4	CR.3.1 TDD	CR.3.1 TDD
RMC				
configuration				
Dedicated		1~4	CCR.3.1 TDD	CCR.3.1 TDD
CORESET RMC				
configuration				
TRS configuration		1~4	TRS.2.1 TDD	N/A
PDSCH/PDCCH		1~4	TCI.State.2	N/A
TCI state				
OCNG Patterns		1~4	OP.1	OP.1
SSB		1, 2	SSB.1 FR2	SSB.1 FR2
		3, 4	SSB.2 FR2	SSB.2 FR2

Propagation	1~4	AWGN
Condition		

Table A.5.6.1.4.1-4: NR Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 with per-UE gaps with DRX

Parameter	Unit	Config	Ce	II 2	Cell 3				
			T1	T2	T1	T2			
AoA setup		1~4	Setup 1 defined in A.3.15.1						
$\hat{E}_{s}/I_{ot}$	dB	1~4 4 -1.46		-Infinity	-1.46				
$N_{oc}$ Note 2	dBm/15 KHz	1~4		-98					
N Note 2	dBm/SCS	1, 2	-89						
1 oc		3, 4	-86						
SS-RSRP	dBm/SCS	1, 2	-85	-85	-Infinity	-85			
		3, 4	-82	-82	-Infinity	-82			
$\hat{E}_s/N_{oc}$	dB	1~4	4	4	-Infinity	4			
Io	dBm/95.04MHz	1, 2	-54.56	-52.21	-54.56	-52.21			

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

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

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table A.5.6.1.4.1-5: Void

Table A.5.6.1.4.1-6: Void

# A.5.6.1.4.2 Test Requirements

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 7.2s for a UE supporting power class 1,
- 4.32s for a UE supporting power class 2, 3 and 4

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 51.20s for a UE supporting power class 1,
- 30.72s for a UE supporting power class 2, 3 and 4

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.5.6.2 Inter-frequency Measurements

# A.5.6.2.1 EN-DC event triggered reporting tests for FR2 cell without SSB time index detection when DRX is not used

### A.5.6.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR2 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.5.6.2.1.1-1, A.5.6.2.1.1-2, and A.5.6.2.1.1-3.

In test 1 measurement gap pattern configuration #0 as defined in Table A.5.6.2.1.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table A.5.6.2.1.1-2 is provided for UE that supports per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 2. Otherwise it is only required to pass test 1.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.2-1. Supported test configurations are shown in table A.5.6.2.1.1-1.

Table A.5.6.2.1.1-1 EN-DC event triggered reporting tests without SSB index reading for FR2-FR2

	Config	Description					
1		LTE FDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode					
2		LTE TDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode					
Note 1:	The UE is only re	equired to be tested in one of the supported test configurations					
Note 2:	target NR cell ha	arget NR cell has the same SCS, BW and duplex mode as NR serving cell					

Table A.5.6.2.1.1-2: General test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

Parameter	Unit	Test	Va	lue	Comment	
		configurati on	Test 1	Test 2		
E-UTRA RF Channel		Config 1,2	1		One E-UTRAN TDD carrier	
Number					frequencies is used.	
NR RF Channel Number		Config 1,2	1,	, 2	Two FR1 NR carrier frequencies is used.	
Active cell		Config 1,2	LTE Cell 1 (PCell) and NR cell 2 (PScell)		LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1.	
Neighbour cell		Config 1,2			NR cell 3 is on NR RF channel number 2.	
Gap Pattern Id		Config 1,2	0	13	As specified in clause 9.1.2-1.	
Measurement gap offset		Config 1,2	39 39			
SMTC-SSB parameters		Config 1,2	SSB.1 FR2		As specified in clause A.3.10.2	
A3-Offset	dB	Config 1,2	[-30]			
Hysteresis	dB	Config 1,2	0			
CP length		Config 1,2	Normal			
TimeToTrigger	S	Config 1,2	0			
Filter coefficient		Config 1,2	0		L3 filtering is not used	
DRX		Config 1,2	OFF		DRX is not used	
AoA setup		Config 1,2	Setup 3		As specified in clause A.3.15	
Time offset between PCell and PSCell		Config 1,2	3 μs		Synchronous EN-DC	
Time offset between serving and neighbour cells		Config 1,2	3μs		Synchronous cells.	
T1	S	Config 1,2	5			
T2	S	Config 1,2	5.2 for PC1; 3.5 for other PC	5.2 for PC1; 3.5 for other PC		

Table A.5.6.2.1.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

Parameter	Unit	Test	Cell 2		C	ell 3
		configuratio	T1	T2	T1	T2
		n				
NR RF Channel Number		Config 1,2		1 2		2
Duplex mode		Config 1,2	TDD			ΓDD
BW <sub>channel</sub>	MHz	Config 1,2	100: N <sub>RB,c</sub> = 66		100: N <sub>RB,c</sub> = 66	
BWP BW	MHz	Config 1,2	100: N <sub>RB,c</sub> = 66		100: N <sub>RB,c</sub> = 66	
TDD configuration		Config 1,2	TDDConf.3.1		TDDConf.3.1	
Initial DL BWP		Config 1,2	DLBWP.0.1		NA	
Initial UL BWP		Config 1,2	ULBWP.0.1		ULBWP.0.1 NA	
Dedicated DL BWP		Config 1,2	DLBV	WP.1.1	NA	

Dedicated UL BWP		Config 1,2	ULBV	VP.1.1	N	IA	
OCNG Patterns defined in A.3.2.1.1 (OP.1)		Config 1,2	OF	P.1	Ol	₽.1	
TRS configuration		Config 1,2	TRS.2.1 TDD		N	NA	
TCI configuration		Config 1,2	CSI-RS.	Config.0	N	IA	
PDSCH Reference measurement channel		Config 1,2	SR.3.	SR.3.1 TDD -		-	
CORESET Reference Channel		Config 1,2	CR.3.	1 TDD		-	
SMTC configuration defined in A.3.11		Config 1,2	SM	TC.1	SM	TC.1	
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2	1:	20	1:	20	
EPRE ratio of PSS to SSS							
EPRE ratio of PBCH DMRS to SSS							
EPRE ratio of PBCH to PBCH DMRS							
EPRE ratio of PDCCH DMRS to SSS							
EPRE ratio of PDCCH to PDCCH DMRS		Config 1,2	0		0		
EPRE ratio of PDSCH DMRS to SSS							
EPRE ratio of PDSCH to PDSCH							
EPRE ratio of OCNG DMRS to SSS(Note 1)							
EPRE ratio of OCNG to OCNG DMRS (Note 1)							
$N_{oc}$ Note2	dBm/15 kHz Note5		NA		NA		
$N_{oc}^{$	dBm/S CS Note4	Config 1,2	NA		NA		
SS-RSRP Note 3	dBm/S CS Note5	Config 1,2	-87	-87	-Infinity	-87	
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	Config 1,2	NA	NA	-Infinity	NA	
$\hat{E}_s/N_{oc}$	dB	Config 1,2	NA	NA	-Infinity	NA	
Io <sup>Note3</sup> Propagation Condition	dBm/95 .04 MHz Note5	Config 1.2	-87	-87	-Infinity	-87	
Fropagation Condition	ı	Config 1,2		A	WVGIN		

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

Note 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone

Note 6: As observed with 0dBi gain antenna at the centre of the quiet zone

# A.5.6.2.1.2 Test Requirements

In test 1 with per-UE gap and in test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

5120 for UE supporting power class 1, or

3200 for UE supporting other power class.

In test 1 and 2 UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.5.6.2.2 EN-DC event triggered reporting tests for FR2 cell without SSB time index detection when DRX is used

# A.5.6.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR2 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.5.6.2.2.1-1, A.5.6.2.2.1-2, and A.5.6.2.2.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.5.6.2.2.1-2 is provided for UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table A.5.6.2.2.1-2 is provided for UE that supports per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.2-1. Supported test configurations are shown in table A.5.6.2.2.1-1.

Table A.5.6.2.2.1-1 EN-DC event triggered reporting tests without SSB index reading for FR2-FR2

	Config	Description
1		LTE FDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2		LTE TDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note 1:	The UE is only re	equired to be tested in one of the supported test configurations
Note 2:	target NR cell ha	is the same SCS, BW and duplex mode as NR serving cell

Table A.5.6.2.2.1-2: General test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

Parameter	Unit	Test		Va	lue		Comment
		configurati	Test	Test	Test	Test	
		on	1	2	3	4	
E-UTRA RF Channel		Config 1,2			1		One E-UTRAN TDD carrier
Number NR RF Channel		Config 1,2		- 1	. 2		frequencies is used.  Two FR1 NR carrier frequencies is
Number		Coming 1,2		1,	,		used.
Active cell		Config 1,2		ell 1 (P( (PScell)	Cell) and	I NR	LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1.
Neighbour cell		Config 1,2	NR ce	II 3			NR cell 3 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2	0 13			As specified in clause 9.1.2-1.	
Measurement gap offset		Config 1,2	39		39		
SMTC-SSB parameters		Config 1,2	SSB.1	FR2	•		As specified in clause A.3.10.2
A3-Offset	dB	Config 1,2	-6				
Hysteresis	dB	Config 1,2	0				
CP length		Config 1,2	Norma	al			
TimeToTrigger	S	Config 1,2	0				
Filter coefficient		Config 1,2	0				L3 filtering is not used
DRX		Config 1,2	DRX .1	DRX DRX DRX DRX		.2	As specified in clause A.3.3
AoA setup		Config 1,2	Setu	Setu	Setu	Setu	As specified in clause A.3.15
			p 1	p 1	p 1	p 1	
Time offset between PCell and PSCell		Config 1,2	3 μs				Synchronous EN-DC
Time offset between serving and neighbour cells		Config 1,2	3µs				Synchronous cells.
T1	S	Config 1,2	5				
T2	S	Config 1,2	8 for PC1; 5 for othe r PC	82 for PC1; 52 for othe r PC	8 for PC1; 5 for othe r PC	82 for PC1; 52 for other PC	

Table A.5.6.2.2.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

Parameter Unit Cell 2 Ce	ell 3
--------------------------	-------

		Test configuratio n	T1	T2	T1	T2
NR RF Channel Number		Config 1,2	,	1		2
Duplex mode		Config 1,2	TE	)D	TDD	
BWchannel	MHz	Config 1,2		RB,c = 66		N <sub>RB,c</sub> = 66
BWP BW	MHz	Config 1,2		$R_{B,c} = 66$		$N_{RB,c} = 66$
TDD configuration		Config 1,2	TDDC			Conf.3.1
Initial DL BWP		Config 1,2	DLBW	/P.0.1		NA
Initial UL BWP		Config 1,2	ULBW	/P.0.1		
Dedicated DL BWP		Config 1,2	DLBV	/P.1.1		NA
Dedicated UL BWP		Config 1,2	ULBW	/P.1.1		NA
OCNG Patterns defined in A.3.2.1.1 (OP.1)		Config 1,2	OF	P.1	(	)P.1
TRS configuration		Config 1,2	TRS.2.	1 TDD		NA
TCI configuration		Config 1,2	CSI-RS.Config.0		NA	
PDSCH Reference measurement channel		Config 1,2	SR.3.1 TDD		-	
CORESET Reference Channel		Config 1,2	CR.3.1 TDD			-
SMTC configuration defined in A.3.11		Config 1,2	SMTC.1		SN	/ITC.1
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2	120			120
EPRE ratio of PSS to SSS						
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS		Config 1,2	(	)		0
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)	-					
$N_{oc}^{ m Note2}$	dBm/15 kHz		-104.7		-1	04.7
$N_{oc}^{$	Note5 dBm/S CS Note4	Config 1,2	-95.7		-95.7	
SS-RSRP Note 3	dBm/S CS Note5	Config 1,2	-89.7	-89.7	-Infinity	-86.7

$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	Config 1,2	6	6	-Infinity	9
$\hat{E}_s/N_{oc}$	dB	Config 1,2	6	6	-Infinity	9
Io <sup>Note3</sup>	dBm/95 .04 MHz Note5	Config 1,2	-59.7	-59.7	-66.7	-57.2
Propagation Condition		Config 1,2	AWGN			

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled
- Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
- Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone

# A.5.6.2.2.2 Test Requirements

In test 1 with per-UE gap and in test 3 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

7680 for UE supporting power class 1, or

4800 for UE supporting other power class.

In test 2 with per-UE gap and in test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X2 ms from the beginning of time period T2, where X2 is

81920 for UE supporting power class 1, or

51200 for UE supporting other power class.

In test 1, 2, 3 and 4 UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.5.6.2.3 EN-DC event triggered reporting tests for FR2 cell with SSB time index detection when DRX is not used

## A.5.6.2.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR2 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.5.6.2.3.1-1, A.5.6.2.3.1-2, and A.5.6.2.3.1-3.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.5.6.2.3.1-1 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table A.5.6.2.3.1-1 is

provided for UE that supports per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 2. Otherwise it is only required to pass test 1.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.2-1. Supported test configurations are shown in table A.5.6.2.3.1-1.

Table A.5.6.2.3.1-1 EN-DC event triggered reporting tests with SSB index reading for FR2-FR2

	Config	Description				
1		LTE FDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode				
2		LTE TDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode				
Note 1:	1: The UE is only required to be tested in one of the supported test configurations					
Note 2:	, ,					

Table A.5.6.2.3.1-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection

Parameter	Unit	Test	Value		Comment		
		configurati on	Test 1	Test 2			
E-UTRA RF Channel Number		Config 1,2		1	One E-UTRAN TDD carrier frequencies is used.		
NR RF Channel Number		Config 1,2	1	, 2	Two FR1 NR carrier frequencies is used.		
Active cell		Config 1,2	LTE Cell 1 (PCell) and NR cell 2 (PScell)				LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1.
Neighbour cell		Config 1,2	NR cell 3		NR cell 3 is on NR RF channel number 2.		
Gap Pattern Id		Config 1,2	0	13	As specified in clause 9.1.2-1.		
Measurement gap offset		Config 1,2	39 39				
SMTC-SSB parameters		Config 1,2	SSB.1 FR2		As specified in clause A.3.10.2		
A3-Offset	dB	Config 1,2	[-30]				
Hysteresis	dB	Config 1,2	0				
CP length		Config 1,2	Normal				
TimeToTrigger	S	Config 1,2	0				
Filter coefficient		Config 1,2	0		L3 filtering is not used		
DRX		Config 1,2	OFF		DRX is not used		
AoA setup		Config 1,2	Setup 3		As specified in clause A.3.15		
Time offset between PCell and PSCell		Config 1,2	3 μs		Synchronous EN-DC		
Time offset between serving and neighbour cells		Config 1,2	3μs		Synchronous cells.		
T1	S	Config 1,2	5				
T2	S	Config 1,2	7 for PC1; 4.5 for other PC	7 for PC1; 4.5 for other PC			

Table A.5.6.2.3.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection

Parameter	Unit	Test	Cell 2	Cell 3
		configuratio n	T1 T2	T1 T2
NR RF Channel Number		Config 1,2	1	2
Duplex mode		Config 1,2	TDD	TDD
BW <sub>channel</sub>	MHz	Config 1,2	100: N <sub>RB,c</sub> = 66	100: N <sub>RB,c</sub> = 66
BWP BW	MHz	Config 1,2	100: N <sub>RB,c</sub> = 66	100: N <sub>RB,c</sub> = 66
TDD configuration		Config 1,2	TDDConf.3.1	TDDConf.3.1
Initial DL BWP		Config 1,2	DLBWP.0.1	NA
Initial UL BWP		Config 1,2	DLBWP.0.1	
Dedicated DL BWP		Config 1,2	DLBWP.1.1	NA
Dedicated UL BWP		Config 1,2	ULBWP.1.1	NA
OCNG Patterns defined in A.3.2.1.1 (OP.1)		Config 1,2	OP.1	OP.1
PDSCH Reference measurement channel		Config 1,2	SR.3.1 TDD	-
CORESET Reference Channel		Config 1,2	CR.3.1 TDD	-
TRS configuration		Config 1,2	TRS.2.1 TDD	NA
TCI configuration		Config 1,2	CSI-RS.Config.0	) NA
SMTC configuration defined in A.3.11		Config 1,2	SMTC.1	SMTC.1
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2	120	120
EPRE ratio of PSS to SSS				
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS		Config 1,2	0	0
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS(Note 1)				
EPRE ratio of OCNG to OCNG DMRS (Note 1)				
$N_{oc}^{\text{Note2}}$	dBm/15		NA	NA
	kHz Note5			
$N_{oc}^{ m Note2}$	dBm/S CS	Config 1,2	NA	NA
	Note4			

SS-RSRP Note 3	dBm/S	Config 1,2	-87	-87	-Infinity	-87
	CS					
	Note5					
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	Config 1,2	NA	NA	-Infinity	NA
$\hat{E}_s/N_{oc}$	dB	Config 1,2	NA	NA	-Infinity	NA
Io <sup>Note3</sup>	dBm/95	Config 1,2	-87	-87	-Infinity	-87
	.04					
	MHz					
	Note5					
Propagation Condition		Config 1,2	AWGN			

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.
- Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
- Note 6: As observed with 0dBi gain antenna at the centre of the quiet zone

## A.5.6.2.3.2 Test Requirements

In test 1 with per-UE gap and in test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

6720 for UE supporting power class 1, or

4160 for UE supporting other power class.

In test 1 and 2 UE is required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.5.6.2.4 EN-DC event triggered reporting tests for FR2 cell with SSB time index detection when DRX is used

# A.5.6.2.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR2 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.5.6.2.4.1-1, A.5.6.2.4.1-2, and A.5.6.2.4.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.5.6.2.4.1-2 is provided for UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table A.5.6.2.4.1-2 is provided for UE that supports per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.2-1. Supported test configurations are shown in table A.5.6.2.4.1-1.

Table A.5.6.2.4.1-1: EN-DC event triggered reporting tests with SSB index reading for FR2-FR2

	Config	Description				
1		LTE FDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode				
2		LTE TDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode				
Note 1:	Note 1: The UE is only required to be tested in one of the supported test configurations					
Note 2:	target NR cell ha	s the same SCS, BW and duplex mode as NR serving cell				

Table A.5.6.2.4.1-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection

Parameter	Unit	Test		Va	lue		Comment
		configurati on	Test 1	Test 2	Test 3	Test 4	
E-UTRA RF Channel Number		Config 1,2			1		One E-UTRAN TDD carrier frequencies is used.
NR RF Channel Number		Config 1,2		1,	2		Two FR1 NR carrier frequencies is used.
Active cell		Config 1,2	LTE C cell 2	ell 1 (P( (PScell)	Cell) and	I NR	LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1.
Neighbour cell		Config 1,2	NR ce	II 3			NR cell 3 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2	0		13		As specified in clause 9.1.2-1.
Measurement gap offset		Config 1,2	39		39		
SMTC-SSB parameters		Config 1,2	SSB.1	FR2			As specified in clause A.3.10.2
A3-Offset	dB	Config 1,2	-6				
Hysteresis	dB	Config 1,2	0				
CP length		Config 1,2	Norma	al			
TimeToTrigger	S	Config 1,2	0				
Filter coefficient		Config 1,2	0				L3 filtering is not used
DRX		Config 1,2	DRX .1	DRX .2	DRX .1	DRX .2	As specified in clause A.3.3
AoA setup		Config 1,2	Setu p 1	Setu p 1	Setu p 1	Setu p 1	As specified in clause A.3.15
Time offset between PCell and PSCell		Config 1,2	3 μs				Synchronous EN-DC
Time offset between serving and neighbour cells		Config 1,2	3µs				Synchronous cells.
T1	S	Config 1,2	5				
T2	S	Config 1,2	for PC1; 6.5 for othe r PC	for PC1; 67 for othe r PC	for PC1; 6.5 for othe r PC	for PC1; 67 for other PC	

Table A.5.6.2.4.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection

Parameter	Unit	Test	Cell 2		Cell 3	
		configuratio	T1	T1 T2		T2
		n				
NR RF Channel Number		Config 1,2	1		2	
Duplex mode		Config 1,2	TI	TDD		TDD
BW <sub>channel</sub>	MHz	Config 1,2	100: N	100: N <sub>RB,c</sub> = 66		N <sub>RB,c</sub> = 66
BWP BW	MHz	Config 1,2	100: N <sub>RB,c</sub> = 66		100: N <sub>RB,c</sub> = 66	
TDD configuration		Config 1,2	TDDConf.3.1		TDDConf.3.1 TDDCor	

Initial DL BWP		Config 1,2	DLBV	VP.0.1	l	NA	
Initial UL BWP		Config 1,2	ULBWP.0.1				
Dedicated DL BWP		Config 1,2	DLBV	DLBWP.1.1 NA		NA	
Dedicated UL BWP		Config 1,2	ULBV	VP.1.1	1	NA	
OCNG Patterns defined in A.3.2.1.1 (OP.1)		Config 1,2	Ol	P.1	C	P.1	
PDSCH Reference measurement channel		Config 1,2		1 TDD		-	
CORESET Reference Channel		Config 1,2		1 TDD		-	
TRS configuration		Config 1,2	TRS.2	.1 TDD	1	NA	
TCI configuration		Config 1,2	CSI-RS	.Config.0	1	NA	
SMTC configuration defined in A.3.11		Config 1,2	SM	TC.1	SM	SMTC.1	
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2	120		120		
EPRE ratio of PSS to SSS  EPRE ratio of PBCH DMRS to SSS  EPRE ratio of PBCH to PBCH DMRS  EPRE ratio of PDCCH DMRS to SSS  EPRE ratio of PDCCH to PDCCH DMRS  EPRE ratio of PDCCH DMRS to SSS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH to PDSCH to PDSCH  EPRE ratio of OCNG DMRS to SSS(Note 1)  EPRE ratio of OCNG to OCNG DMRS (Note 1) $N_{oc}^{\text{Note2}}$	dBm/15 kHz Note5 dBm/S	Config 1,2	-1(	0)4.7	-104.7 -95.7		
SS-RSRP Note 3	CS Note4	Config 1 2	90.7			96.7	
33-N3N7	dBm/S CS Note5	Config 1,2	-89.7	-89.7	-Infinity	-86.7	
$\hat{E}_{s}/I_{ot}$	dB	Config 1,2	6	6	-Infinity	9	
$\hat{E}_s/N_{oc}$ lo <sup>Note3</sup>	dB	Config 1,2	6	6	-Infinity	9	
	dBm/95 .04 MHz Note5	Config 1,2	-59.7	-59.7	-66.7	-57.2	
Propagation Condition		Config 1,2		Α	WGN		

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

Note 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone

Note 6: As observed with 0dBi gain antenna at the centre of the quiet zone

# A.5.6.2.2.4 Test Requirements

In test 1 with per-UE gap and in test 3 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

10080 for UE supporting power class 1, or

6240 for UE supporting other power class.

In test 2 with per-UE gap and in test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X2 ms from the beginning of time period T2, where X2 is

107520 for UE supporting power class 1, or

66560 for UE supporting other power class.

In test 1, 2, 3 and 4 UE is required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.5.6.2.5 EN-DC event triggered reporting tests for FR2 cell without SSB time index detection when DRX is not used

#### A.5.6.2.5.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.5.6.2.5.1-1, A.5.6.2.5.1-2, and A.5.6.2.5.1-3.

In test 1 measurement gap pattern configuration #0 as defined in Table A.5.6.2.5.1-2 is provided for a UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table A.5.6.2.5.1-2 is provided for UE that support per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 2. Otherwise it is only required to pass test 1.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.1-1. Supported test configurations are shown in table A.5.6.2.5.1-1.

Table A.5.6.2.5.1-1: EN-DC event triggered reporting tests without SSB index reading for FR1-FR2

Config	Description of serving cell	Description of target cell
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD	120 kHz SSB SCS,
	duplex mode	100 MHz bandwidth, TDD
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD	duplex mode
	duplex mode	
3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD	
	duplex mode	
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD	
	duplex mode	
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD	
	duplex mode	
6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD	
	duplex mode	
Note: The UI	E is only required to be tested in one of the supported test configura	tions

Table A.5.6.2.5.1-2: General test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

Parameter	Unit	Test	Value		Comment
- aramotor		configurati	Test 1	Test 2	-
E-UTRA RF Channel		Config		1	One E-UTRAN TDD carrier
Number		1,2,3,4,5,6			frequencies is used.
NR RF Channel Number		Config 1,2,3,4,5,6	1	, 2	Two FR1 NR carrier frequencies is used.
Active cell		Config 1,2,3,4,5,6	LTE Cell 1 (Pocell)		LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3,4,5,6	NR cell 3		NR cell 3 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3,4,5,6	0	13	As specified in clause 9.1.2-1.
Measurement gap offset		Config 1,2,3,4,5,6	39	39	
SMTC-SSB parameters on NR RF Channel 1		Config 1,4	SSB.1 FR1		As specified in clause A.3.10.1
		Config 2,5	SSB.1 FR1		As specified in clause A.3.10.1
		Config 3,6	SSB.2 FR1		As specified in clause A.3.10.1
SMTC-SSB parameters on NR RF Channel 2		Config 1,2,3,4,5,6	SSB.1 FR2		As specified in clause A.3.10.2
offsetMO	dB	Config 1,2,3,4,5,6	6		
Hysteresis	dB	Config 1,2,3,4,5,6	0		
a4-Threshold	dBm	Config 1,2,3,4,5,6	[-120]		
CP length		Config 1,2,3,4,5,6	Normal		
TimeToTrigger	S	Config 1,2,3,4,5,6	0		
Filter coefficient		Config 1,2,3,4,5,6	0		L3 filtering is not used
DRX		Config 1,2,3,4,5,6	OFF		DRX is not used
AoA setup		Config 1,2	Setup 3		As specified in clause A.3.15
Time offset between PCell and PSCell		Config 1,2,3,4,5,6	3 μs		Synchronous EN-DC
Time offset between serving and neighbour cells		Config 1,4	3ms		Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		Config 2,3,5,6	3μs		Synchronous cells.
T1	S	Config 1,2,3,4,5,6	5		
T2	S	Config 1,2,3,4,5,6	5.2 for PC1; 3.5 for other PC	5.2 for PC1; 3.5 for other PC	

Table A.5.6.2.5.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

Parameter	Unit	Test	Ce	ell 2	Cell 3	
		configuratio	T1 T2		T1 T2	
NR RF Channel Number		n Config		1		2
With Chamic Number		1,2,3,4,5,6		'		2
Duplex mode		Config 1,4	F	DD		TDD
Duplex mede		Config	TDD			TDD
		2,3,5,6	•			
BW <sub>channel</sub>	MHz	Config 1,4	10: N <sub>F</sub>	<sub>RB,c</sub> = 52	100:	N <sub>RB,c</sub> = 66
		Config 2,5	10: N <sub>F</sub>	<sub>RB,c</sub> = 52	100:	N <sub>RB,c</sub> = 66
		Config 3,6	40: N <sub>RI</sub>	<sub>B,c</sub> = 106		N <sub>RB,c</sub> = 66
BWP BW	MHz	Config 1,4	10: N <sub>F</sub>	<sub>RB,c</sub> = 52		N <sub>RB,c</sub> = 66
		Config 2,5		<sub>RB,c</sub> = 52		N <sub>RB,c</sub> = 66
		Config 3,6		<sub>B,c</sub> = 106		N <sub>RB,c</sub> = 66
TDD configuration		Config 2,5	TDDC	onf.1.1	TDD	Conf.3.1
		Config 3,6	TDDC	conf.2.1	TDD	Conf.3.1
Initial DL BWP		Config 1,2,3,4,5,6	DLBV	VP.0.1		NA
Initial UL BWP		Config 1,2,3,4,5,6	ULBV	VP.0.1		NA
Dedicated DL BWP		Config 1,2,3,4,5,6	DLBWP.1.1		NA	
Dedicated UL BWP		Config 1,2,3,4,5,6	ULBWP.1.1		NA	
OCNG Patterns defined in A.3.2.1.1 (OP.1)		Config 1,2,3,4,5,6	OP.1		OP.1	
PDSCH Reference		Config 1,4	SR 1	1 FDD		-
measurement channel		Config 2,5		1 TDD		
		Config 3,6		1 TDD	1	
CORESET Reference		Config 1,4		1 FDD		_
Channel		Config 2,5		1 TDD	1	
		Config 3,6		1 TDD		
SMTC configuration defined in A.3.11		Config 1,4		TC.2	SI	MTC.2
		Config 2,3,5,6	SM	TC.1	SI	MTC.1
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2,4,5	,	15		120
		Config 3,6	- 3	30		120
EPRE ratio of PSS to SSS						
EPRE ratio of PBCH DMRS to SSS		1				
EPRE ratio of PBCH to PBCH DMRS		1				
EPRE ratio of PDCCH DMRS to SSS		Config 1,2,3,4,5,6	0			0
EPRE ratio of PDCCH to PDCCH DMRS		1,2,0,4,0,0				
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						

EPRE ratio of OCNG DMRS							
to SSS(Note 1)							
EPRE ratio of OCNG to							
OCNG DMRS (Note 1)							
$N_{oc}^{ m Note2}$	dBm/15				NA		
00	kHz						
	Note5						
$N_{oc}^{ m Note2}$	dBm/S	Config			NA		
00	CS	1,2,4,5					
	Note4	Config 3,6			NA		
SS-RSRP Note 3	dBm/S	Config		-Infinity	-87		
	CS	1,2,4,5					
	Note5	Config 3,6		-Infinity	-87		
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	Config		-Infinity	NA		
L <sub>s</sub> / L <sub>ot</sub>		1,2,3,4,5,6	NA				
$\hat{E}_s/N_{oc}$	dB	Config	Link only, see clause	-Infinity	NA		
$= s / v_{oc}$		1,2,3,4,5,6	A.3.7A				
Io <sup>Note3</sup>	dBm/9.	Config		-	-		
	36MHz	1,2,4,5					
	dBm/38	Config 3,6		-	-		
	.16MHz						
	dBm/95	Config		-Infinity	-87		
	.04	1,2,3,4,5,6					
	MHz						
	Note5						
Propagation Condition		Config		A'	WGN		
		1,2,3,4,5,6					
Note 1: OCNG shall be used	such that b	ooth cells are full	y allocated and a constar	nt total transi	mitted power		
spectral density is achieved for all OFDM symbols.							
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant							
over subcarriers and time and shall be modelled as AWCN of appropriate power for AL to be							

- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.
- Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
- Note 6: As observed with 0dBi gain antenna at the centre of the guiet zone

# A.5.6.2.5.2 Test Requirements

In test 1 with per-UE gap and in test 2 with per-FR gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

5120 for UE supporting power class 1, or

3200 for UE supporting other power class.

In test 1 and 2 UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.5.6.2.6 EN-DC event triggered reporting tests for FR2 cell without SSB time index detection when DRX is used

# A.5.6.2.6.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.5.6.2.6.1-1, A.5.6.2.6.1-2, and A.5.6.2.6.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.5.6.2.6.1-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table A.5.6.2.6.1-2 is provided for UE that support per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.1-1. Supported test configurations are shown in table A.5.6.2.6.1-1.

Table A.5.6.2.6.1-1: EN-DC event triggered reporting tests without SSB index reading for FR1-FR2

Config	Description of serving cell	Description of target cell				
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD	120 kHz SSB SCS,				
	duplex mode	100 MHz bandwidth, TDD				
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD	duplex mode				
	duplex mode					
3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD					
	duplex mode					
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD					
	duplex mode					
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD					
	duplex mode					
6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD					
	duplex mode					
Note: The UE is only required to be tested in one of the supported test configurations						

Table A.5.6.2.6.1-2: General test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

Parameter	Unit	Test		Value			Comment
		configurati on	Test 1	Test 2	Test 3	Test 4	
E-UTRA RF Channel Number		Config 1,2,3,4,5,6	1				One E-UTRAN TDD carrier frequencies is used.
NR RF Channel Number		Config 1,2,3,4,5,6	1, 2			Two FR1 NR carrier frequencies is used.	

Active cell		Config 1,2,3,4,5,6	LTE Cell 1 (PCell) and NR cell 2 (PScell)		NR	LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1.	
Neighbour cell		Config 1,2,3,4,5,6	NR ce	II 3			NR cell 3 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3,4,5,6	0		13		As specified in clause 9.1.2-1.
Measurement gap offset		Config 1,2,3,4,5,6	39		39		
SMTC-SSB parameters on NR RF Channel 1		Config 1,4	SSB.1				As specified in clause A.3.10.1
		Config 2,5	SSB.1	FR1			As specified in clause A.3.10.1
		Config 3,6	SSB.2	FR1			As specified in clause A.3.10.1
SMTC-SSB parameters on NR RF Channel 2		Config 1,2,3,4,5,6	SSB.1	FR2			As specified in clause A.3.10.2
offsetMO	dB	Config 1,2,3,4,5,6	6				
Hysteresis	dB	Config 1,2,3,4,5,6	0				
a4-Threshold	dBm	Config 1,2,3,4,5,6	[-120]				
CP length		Config 1,2,3,4,5,6	Normal				
TimeToTrigger	S	Config 1,2,3,4,5,6	0				
Filter coefficient		Config 1,2,3,4,5,6	0				L3 filtering is not used
DRX		Config 1,2,3,4,5,6	DRX .1	DRX .2	DRX .1	DRX .2	As specified in clause A.3.3
AoA setup		Config 1,2	Setu p 1	Setu p 1	Setu p 1	Setu p 1	As specified in clause A.3.15
Time offset between PCell and PSCell		Config 1,2,3,4,5,6	3 μs				Synchronous EN-DC
Time offset between serving and neighbour cells		Config 1,4	3ms				Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		Config 2,3,5,6	3μs				Synchronous cells.
T1	S	Config 1,2,3,4,5,6	5				
T2	S	Config 1,2,3,4,5,6	8 for PC1; 5 for othe r PC	82 for PC1; 52 for othe r PC	8 for PC1; 5 for othe r PC	82 for PC1; 52 for other PC	

Table A.5.6.2.6.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

Parameter	Unit	Test	Cell 2		Cell 3		
		configuratio	T1	T2	T1	T2	
		n					
NR RF Channel Number		Config	1		1 2		2
		1,2,3,4,5,6					

Duplex mode		Config 1,4	FDD	TDD
		Config	TDD	TDD
		2,3,5,6		
BWchannel	MHz	Config 1,4	10: N <sub>RB,c</sub> = 52	100: N <sub>RB,c</sub> = 66
		Config 2,5	10: N <sub>RB,c</sub> = 52	100: N <sub>RB,c</sub> = 66
		Config 3,6	40: N <sub>RB,c</sub> = 106	100: N <sub>RB,c</sub> = 66
BWP BW	MHz	Config 1,4	10: N <sub>RB,c</sub> = 52	100: N <sub>RB,c</sub> = 66
		Config 2,5	10: N <sub>RB,c</sub> = 52	100: N <sub>RB,c</sub> = 66
TDD f f		Config 3,6	40: N <sub>RB,c</sub> = 106	100: N <sub>RB,c</sub> = 66
TDD configuration		Config 2,5	TDDConf.1.1	TDDConf.3.1
		Config 3,6	TDDConf.2.1	TDDConf.3.1
Initial DL BWP		Config 1,2,3,4,5,6	DLBWP.0.1	NA
Initial UL BWP		Config 1,2,3,4,5,6	ULBWP.0.1	NA
Dedicated DL BWP		Config 1,2,3,4,5,6	DLBWP.1.1	NA
Dedicated UL BWP		Config 1,2,3,4,5,6	ULBWP.1.1	NA
OCNG Patterns defined in A.3.2.1.1 (OP.1)		Config 1,2,3,4,5,6	OP.1	OP.1
PDSCH Reference		Config 1,4	SR.1.1 FDD	-
measurement channel		Config 2,5	SR.1.1 TDD	
		Config 3,6	SR2.1 TDD	
CORESET Reference		Config 1,4	CR.1.1 FDD	-
Channel		Config 2,5	CR.1.1 TDD	
		Config 3,6	CR2.1 TDD	
SMTC configuration defined in A.3.11		Config 1,4	SMTC.2	SMTC.2
		Config 2,3,5,6	SMTC.1	SMTC.1
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2,4,5	15	120
		Config 3,6	30	120
EPRE ratio of PSS to SSS				
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS		Config 1,2,3,4,5,6	0	0
EPRE ratio of PDSCH DMRS to SSS		-,-,0,.,0,0		
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS(Note 1)				
EPRE ratio of OCNG to OCNG DMRS (Note 1)				
$N_{oc}^{ m Note2}$	dBm/15			-104.7
	kHz Noto5		NA Link only one eleves	
λτ Note2	Note5	Config	Link only, see clause A.3.7A	-95.7
$N_{oc}^{Note2}$		1,2,4,5	7.5.77	-93.1

	dBm/S CS	Config 3,6		-(	95.7
	Note4				
SS-RSRP Note 3	dBm/S	Config		-Infinity	-86.7
	CS	1,2,4,5			
	Note5	Config 3,6		-Infinity	-86.7
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	Config		-Infinity	9
S / Tot		1,2,3,4,5,6			
$\hat{E}_s/N_{oc}$	dB	Config		-Infinity	9
		1,2,3,4,5,6		-	
Io <sup>Note3</sup>	dBm/9.	Config		-	-
	36MHz	1,2,4,5			
	dBm/38	Config 3,6		-	-
	.16MHz				
	dBm/95	Config	]	-66.7	-57.2
	.04	1,2,3,4,5,6			
	MHz				
	Note5				
Propagation Condition		Config		A۱	WGN
		1,2,3,4,5,6			

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled
- Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
- Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone

### A.5.6.2.6.2 Test Requirements

In test 1 with per-UE gap and in test 3 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

7680 for UE supporting power class 1, or

4800 for UE supporting other power class.

In test 2 with per-UE gap and in test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X2 ms from the beginning of time period T2, where X2 is

81920 for UE supporting power class 1, or

51200 for UE supporting other power class.

In test 1, 2, 3 and 4 UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.5.6.2.7 EN-DC event triggered reporting tests for FR2 cell with SSB time index detection when DRX is not used

## A.5.6.2.7.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.5.6.2.7.1-1, A.5.6.2.7.1-2, and A.5.6.2.7.1-3.

In test 1 measurement gap pattern configuration #0 as defined in Table A.5.6.2.7.1-2 is provided for a UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table A.5.6.2.7.1-2 is provided for UE that support per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 2. Otherwise it is only required to pass test 1.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.1-1. Supported test configurations are shown in table A.5.6.2.7.1-1.

Table A.5.6.2.7.1-1: EN-DC event triggered reporting tests with SSB index reading for FR1-FR2

Config	Description of serving cell	Description of target cell						
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD	120 kHz SSB SCS,						
	duplex mode	100 MHz bandwidth, TDD						
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD	duplex mode						
	duplex mode							
3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD							
	duplex mode							
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD							
	duplex mode							
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD							
	duplex mode							
6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD							
	duplex mode							
Note: The U	Note: The UE is only required to be tested in one of the supported test configurations							

Table A.5.6.2.7.1-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection

Parameter	Unit	Test	Value		Comment
		configurati on	Test 1	Test 2	
E-UTRA RF Channel Number		Config 1,2,3,4,5,6		1	One E-UTRAN TDD carrier frequencies is used.
NR RF Channel Number		Config 1,2,3,4,5,6	1,	, 2	Two FR1 NR carrier frequencies is used.
Active cell		Config 1,2,3,4,5,6	LTE Cell 1 (Pocell)		LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3,4,5,6	NR cell 3		NR cell 3 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3,4,5,6	0	13	As specified in clause 9.1.2-1.
Measurement gap offset		Config 1,2,3,4,5,6	39	39	
SMTC-SSB parameters on NR RF Channel 1		Config 1,4	SSB.1 FR1		As specified in clause A.3.10.1
		Config 2,5	SSB.1 FR1		As specified in clause A.3.10.1
		Config 3,6	SSB.2 FR1		As specified in clause A.3.10.1
SMTC-SSB parameters on NR RF Channel 2		Config 1,2,3,4,5,6	SSB.1 FR2		As specified in clause A.3.10.2
offsetMO	dB	Config 1,2,3,4,5,6	6		
Hysteresis	dB	Config 1,2,3,4,5,6	0		
a4-Threshold	dBm	Config 1,2,3,4,5,6	[-120]		
CP length		Config 1,2,3,4,5,6	Normal		
TimeToTrigger	S	Config 1,2,3,4,5,6	0		
Filter coefficient		Config 1,2,3,4,5,6	0		L3 filtering is not used
DRX		Config 1,2,3,4,5,6	OFF		DRX is not used
AoA setup		Config 1,2	Setup 3		As specified in clause A.3.15
Time offset between PCell and PSCell		Config 1,2,3,4,5,6	3 μs		Synchronous EN-DC
Time offset between serving and neighbour cells		Config 1,4	3ms		Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		Config 2,3,5,6	3µs		Synchronous cells.
T1	s	Config 1,2,3,4,5,6	5		
T2	S	Config 1,2,3,4,5,6	7 for PC1; 4.5 for other PC	7 for PC1; 4.5 for other PC	

Table A.5.6.2.7.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection

Parameter	Unit	Test	Cell 2	Cell 3
		configuratio n	T1 T2	T1 T2
NR RF Channel Number		Config 1,2,3,4,5,6	1	2
Duplex mode		Config 1,4	FDD	TDD
		Config	TDD	TDD
		2,3,5,6		
BW <sub>channel</sub>	MHz	Config 1,4	10: N <sub>RB,c</sub> = 52	100: N <sub>RB,c</sub> = 66
		Config 2,5	10: N <sub>RB,c</sub> = 52 40: N <sub>RB,c</sub> = 106	100: N <sub>RB,c</sub> = 66 100: N <sub>RB,c</sub> = 66
BWP BW	MHz	Config 3,6 Config 1,4	10: N <sub>RB,c</sub> = 52	100: N <sub>RB,c</sub> = 66
BWI BW	IVII IZ	Config 2,5	10: N <sub>RB,c</sub> = 52	100: N <sub>RB,c</sub> = 66
		Config 3,6	40: N <sub>RB,c</sub> = 106	100: N <sub>RB,c</sub> = 66
OCNG Patterns defined in A.3.2.1.1 (OP.1)		Config 1,2,3,4,5,6	OP.1	OP.1
PDSCH Reference		+	CD 1 1 EDD	_
measurement channel		Config 1,4	SR.1.1 FDD	_
medearement ename.		Config 2,5	SR.1.1 TDD SR2.1 TDD	_
CORESET Reference		Config 3,6 Config 1,4	CR.1.1 FDD	
Channel		Config 1,4	CR.1.1 TDD	
oname.		Config 3,6	CR2.1 TDD	
TDD configuration		Config 2,5	TDDConf.1.1	TDDConf.3.1
		Config 3,6	TDDConf.2.1	TDDConf.3.1
Initial DL BWP		Config 1,2,3,4,5,6	DLBWP.0.1	NA
Initial UL BWP		Config 1,2,3,4,5,6	ULBWP.0.1	NA
Dedicated DL BWP		Config 1,2,3,4,5,6	DLBWP.1.1	NA
Dedicated UL BWP		Config 1,2,3,4,5,6	ULBWP.1.1	NA
SMTC configuration defined in A.3.11		Config 1,4	SMTC.2	SMTC.2
		Config 2,3,5,6	SMTC.1	SMTC.1
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2,4,5	15	120
		Config 3,6	30	120
EPRE ratio of PSS to SSS		]		
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS		Config 1,2,3,4,5,6	0	0
EPRE ratio of PDCCH to PDCCH DMRS		1,2,0,7,0,0		
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				

	of OCNG DMRS						
to SSS(Note							
EPRE ratio							
OCNG DMR	RS (Note 1)	dBm/15					
$N_{oc}^{ m Note2}$	$N_{cc}^{ m Note2}$				NA		
		kHz					
		Note5					
$N_{oc}^{ m Note2}$		dBm/S	Config			NA	
00		CS	1,2,4,5				
		Note4	Config 3,6			NA	
SS-RSRP No	ote 3	dBm/S	Config		-Infinity	-87	
		CS	1,2,4,5				
		Note5	Config 3,6		-Infinity	NA	
$\hat{E}_{s}/I_{ot}$		dB	Config		-Infinity	NA	
L <sub>s</sub> / L <sub>ot</sub>			1,2,3,4,5,6	NA	•		
$\hat{E}_s/N_{oc}$		dB	Config	Link only, see clause	-Infinity	-87	
2 <sub>s</sub> /1, oc			1,2,3,4,5,6	A.3.7A			
Io <sup>Note3</sup>		dBm/9.	Config		-	-	
		36MHz	1,2,4,5				
		dBm/38	Config 3,6		-	-	
		.16MHz					
		dBm/95	Config		-Infinity	-87	
		.04	1,2,3,4,5,6		,		
		MHz					
		Note5					
Propagation Condition			Config		A۱	WGN	
			1,2,3,4,5,6				
Note 1: O	CNG shall be used	such that b	ooth cells are ful	y allocated and a consta	nt total trans	mitted power	
	spectral density is achieved for all OFDM symbols.						
				not specified in the test is	assumed to	be constant	
				as AWGN of appropriate			
	EJEU-J						

- fulfilled.
- Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- SS-RSRP minimum requirements are specified assuming independent interference and noise at Note 4: each receiver antenna port.
- Note 5: Equivalent power received by an antenna with 0dBi gain at the centre of the guiet zone
- Note 6: As observed with 0dBi gain antenna at the centre of the quiet zone

#### A.5.6.2.7.2 Test Requirements

In test 1 with per-UE gap and in test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

6720 for UE supporting power class 1, or

4160 for UE supporting other power class.

In test 1 and 2 UE is required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.5.6.2.8 EN-DC event triggered reporting tests for FR2 cell with SSB time index detection when DRX is used

## A.5.6.2.8.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.5.6.2.8.1-1, A.5.6.2.8.1-2, and A.5.6.2.8.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.5.6.2.8.1-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table A.5.6.2.8.1-2 is provided for UE that support per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.1-1. Supported test configurations are shown in table A.5.6.2.8.1-1.

Table A.5.6.2.8.1-1: EN-DC event triggered reporting tests without SSB index reading for FR1-FR2

Config	Description of serving cell	Description of target cell
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD	120 kHz SSB SCS,
	duplex mode	100 MHz bandwidth, TDD
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD	duplex mode
	duplex mode	
3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD	
	duplex mode	
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD	
	duplex mode	
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD	
	duplex mode	
6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD	
	duplex mode	
Note: The U	E is only required to be tested in one of the supported test configura	tions

Table A.5.6.2.8.1-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection

Parameter	Unit	Test	Value				Comment	
		configurati on	Test 1	Test 2	Test 3	Test 4		
E-UTRA RF Channel Number		Config 1,2,3,4,5,6	1			One E-UTRAN TDD carrier frequencies is used.		
NR RF Channel Number		Config 1,2,3,4,5,6	1, 2			Two FR1 NR carrier frequencies is used.		
Active cell		Config 1,2,3,4,5,6	LTE Cell 1 (PCell) and NR cell 2 (PScell)			I NR	LTE Cell 1 is on E-UTRA RF channel number 1. NR Cell 2 is on NR RF channel number 1.	
Neighbour cell		Config 1,2,3,4,5,6	NR ce	II 3			NR cell 3 is on NR RF channel number 2.	
Gap Pattern Id		Config 1,2,3,4,5,6	0		13		As specified in clause 9.1.2-1.	
Measurement gap offset		Config 1,2,3,4,5,6	39		39			
SMTC-SSB parameters on NR RF Channel 1		Config 1,4	SSB.1	FR1			As specified in clause A.3.10.1	
		Config 2,5	SSB.1	FR1			As specified in clause A.3.10.1	
		Config 3,6	SSB.2	FR1			As specified in clause A.3.10.1	
SMTC-SSB parameters on NR RF Channel 2		Config 1,2,3,4,5,6	SSB.1	FR2			As specified in clause A.3.10.2	
offsetMO	dB	Config 1,2,3,4,5,6	6					
Hysteresis	dB	Config 1,2,3,4,5,6	0					
a4-Threshold	dBm	Config 1,2,3,4,5,6	[-120]					
CP length		Config 1,2,3,4,5,6	Norma	al				
TimeToTrigger	s	Config 1,2,3,4,5,6	0					
Filter coefficient		Config 1,2,3,4,5,6	0				L3 filtering is not used	
DRX		Config 1,2,3,4,5,6	DRX .1	DRX .2	DRX .1	DRX .2	As specified in clause A.3.3	
AoA setup		Config 1,2	Setu p 1	Setu p 1	Setu p 1	Setu p 1	As specified in clause A.3.15	
Time offset between PCell and PSCell		Config 1,2,3,4,5,6	3 μs			Synchronous EN-DC		
Time offset between serving and neighbour cells		Config 1,4	3ms				Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.	
		Config 2,3,5,6	3μs			Synchronous cells.		
T1	s	Config 1,2,3,4,5,6	5					
T2	S	Config 1,2,3,4,5,6	for PC1; 6.5 for othe r PC	108 for PC1; 67 for othe r PC	for PC1; 6.5 for othe r PC	108 for PC1; 67 for other PC		

Table A.5.6.2.8.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection

Parameter	Unit	Test	Cell	2	Cell 3		
		configuratio n	T1	T2	T1	T2	
NR RF Channel Number		Config 1,2,3,4,5,6	1			2	
Duplex mode		Config 1,4	FDI	D	Т	DD	
•		Config	TDD		T	TDD	
DIM	N 41 1	2,3,5,6	40 N	<u> </u>	400 1		
BW <sub>channel</sub>	MHz	Config 1,4 Config 2,5	10: N <sub>RB,</sub>			I <sub>RB,c</sub> = 66 I <sub>RB,c</sub> = 66	
		Config 3,6	40: N <sub>RB,c</sub>			$I_{RB,c} = 66$	
BWP BW	MHz	Config 1,4	10: N <sub>RB</sub> ,			I <sub>RB,c</sub> = 66	
		Config 2,5	10: N <sub>RB,c</sub> = 52		100: N <sub>RB,c</sub> = 66		
		Config 3,6	40: N <sub>RB,c</sub>		100: N	I <sub>RB,c</sub> = 66	
OCNG Patterns defined in A.3.2.1.1 (OP.1)		Config 1,2,3,4,5,6	OP.	1	C	P.1	
PDSCH Reference		Config 1,4	SR.1.1	FDD		-	
measurement channel		Config 2,5	SR.1.1	TDD	1		
		Config 3,6	SR2.1	TDD	<u></u>		
CORESET Reference		Config 1,4	CR.1.1			-	
Channel		Config 2,5	CR.1.1				
TDD ( );		Config 3,6	CR2.1		TDD	2 10 1	
TDD configuration		Config 2,5	TDDCo		TDDConf.3.1		
		Config 3,6	TDDCo	nf.2.1	TDD0	Conf.3.1	
Initial DL BWP		Config 1,2,3,4,5,6	DLBWF	DLBWP.0.1		NA	
Initial UL BWP		Config 1,2,3,4,5,6	ULBWP.0.1			NA	
Dedicated DL BWP		Config 1,2,3,4,5,6	DLBW	P.1.1		NA	
Dedicated UL BWP		Config 1,2,3,4,5,6	ULBWF	P.1.1		NA	
SMTC configuration defined in A.3.11		Config 1,4	SMT	C.2	SM	ITC.2	
		Config 2,3,5,6	SMT	C.1	SM	ITC.1	
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2,4,5	15			120	
		Config 3,6	30			120	
EPRE ratio of PSS to SSS		<u> </u>					
EPRE ratio of PBCH DMRS to SSS							
EPRE ratio of PBCH to PBCH DMRS							
PRE ratio of PDCCH DMRS		Config 1,2,3,4,5,6	0		0		
EPRE ratio of PDCCH to PDCCH DMRS		1,2,0,1,0,0					
EPRE ratio of PDSCH DMRS to SSS							
EPRE ratio of PDSCH to PDSCH							

EPRE ratio of OCNG DMRS					
to SSS(Note 1)					
EPRE ratio of OCNG to					
OCNG DMRS (Note 1)					
$N_{oc}^{ m Note2}$	dBm/15			-1	04.7
00	kHz				
	Note5				
$N_{oc}^{ m Note2}$	dBm/S	Config		-9	95.7
00	CS	1,2,4,5			
	Note4	Config 3,6		-9	95.7
SS-RSRP Note 3	dBm/S	Config		-Infinity	-86.7
	CS	1,2,4,5			
	Note5	Config 3,6		-Infinity	-86.7
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	Config		-Infinity	9
•		1,2,3,4,5,6	NA		
$\hat{E}_s/N_{oc}$	dB	Config	Link only, see clause	-Infinity	9
		1,2,3,4,5,6	A.3.7A		
lo <sup>Note3</sup>	dBm/9.	Config		-	-
	36MHz	1,2,4,5			
	dBm/38	Config 3,6		-	-
	.16MHz				
	dBm/95	Config		-66.7	-57.2
	.04	1,2,3,4,5,6			
	MHz				
	Note5				
Propagation Condition		Config		A\	NGN
		1,2,3,4,5,6			
			ly allocated and a consta	nt total trans	mitted power
spectral density is a					
			not specified in the test is		
over subcarriers and	I time and s	hall be modelled	l as AWGN of appropriate	e power for	$N_{oc}$ to be

- fulfilled.
- SS-RSRP and lo levels have been derived from other parameters for information purposes. They Note 3: are not settable parameters themselves.
- SS-RSRP minimum requirements are specified assuming independent interference and noise at Note 4: each receiver antenna port.
- Note 5: Equivalent power received by an antenna with 0dBi gain at the centre of the guiet zone
- Note 6: As observed with 0dBi gain antenna at the centre of the quiet zone

#### A.5.6.2.8.2 Test Requirements

In test 1 with per-UE gap and in test 3 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

10080 for UE supporting power class 1, or

6240 for UE supporting other power class.

In test 2 with per-UE gap and in test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X2 ms from the beginning of time period T2, where X2 is

107520 for UE supporting power class 1, or

66560 for UE supporting other power class.

In test 1, 2, 3 and 4 UE is required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.5.6.3 L1-RSRP measurement for beam reporting

# A.5.6.3.1 SSB based L1-RSRP measurement when DRX is not used

### A.5.6.3.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5.4.1, with the testing configurations for NR cells in Table A.5.6.3.1.1-1.

The AoA setup for this test is Setup 1 as defined in clause A.3.15

Table A.5.6.3.1.1-1: Applicable NR configurations for FR2 SSB based L1-RSRP test

Config	Description				
1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode				
2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode				
3	LTE FDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode				
4	LTE TDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode				
Note: The UE is only required to be tested in one of the supported test configurations					

# A.5.6.3.1.2 Test parameters

There are two cells in the test, E-UTRAN PCell (Cell 1) and FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.5.6.3.1.2-1 and Table A.5.6.3.1.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

Table A.5.6.3.1.2-1: General test parameters

Parameter	Config	Unit	Value
SSB GSCN	1~4		freq1
Duplex mode	1~4		TDD
TDD Configuration	1~4		TDDConf.3.1
BW <sub>channel</sub>	1~4	MHz	100: N <sub>RB,c</sub> = 66
PDSCH Reference measurement channel	1~4		SR.3.1 TDD
RMSI CORESET Reference Channel	1~4		CR.3.1 TDD
Dedicated CORESET Reference Channel	1~4		CCR.3.1 TDD
SSB configuration	1,2		SSB.1 FR2
	3,4		SSB.2 FR2
OCNG Patterns	1~4		OP.1
Initial BWP Configuration	1~4		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~4		DLBWP.1.3 ULBWP.1.3
SMTC configuration	1~4		SMTC.1
TRS Configuration	1~4		TRS.2.1 TDD
PDCCH/PDSCH TCI Configuration	1~4		TCI.State.2
DRX configuration	1~4		Off
reportConfigType	1~4		periodic
reportQuantity	1~4		ssb-Index-RSRP
Number of reported RS	1~4		2
L1-RSRP reporting period	1~4	slot	640
T1	1~4	S	5
T2	1~4	S	1
Propagation condition	1~4		AWGN
EPRE ratio of PSS to SSS	1 7		7111011
EPRE ratio of PBCH DMRS to SSS	1		
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH			
DMRS			
EPRE ratio of PDSCH DMRS to SSS	1~4	dB	0
EPRE ratio of PDSCH to PDSCH			
DMRS			
EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>			
EPRE ratio of OCNG to OCNG DMRS Note 1			
Propagation condition	1~4		AWGN

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

Doromotor	Config	l lmi4	SSB#0		SSB#1			
Parameter		Unit	T1	T2	T1	T2		
Angle of arrival configuration			Setup 1 according to A.3.15.1					
$N_{oc}^{ m Note2}$	1~4	dBm/15kHz	-105					
$N_{oc}^{}$ Note2	1,2	dBm/SSB SCS		-96				
TV <sub>oc</sub>	3,4	UBIII/33B 3C3	-93					
${ m \hat{E}}_{ m s}/{ m I}_{ m ot}$	1~4	dB	0	0	-Infinity	9		
SSB RSRP Note3	1,2	dBm/SSB SCS	-96	-96	-Infinity	-87		
CODITION	3,4		-93	-93	-Infinity	-84		
lo <sup>Note3</sup>	1,2	dBm/95.04MHz	-67.5	-67.5	-71.1	-60.7		
	3,4		-67.5	-67.5	-71.1	-60.7		
$\hat{E}_s/N_{oc}$	1~4	dB	0	0	-Infinity	9		

Table A.5.6.3.1.2-2: SSB specific test parameters

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

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

Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

### A.5.6.3.1.3 Test Requirements

The UE shall send L1-RSRP report every 640 slots. No later than X ms plus 640 slots from the beginning of time period T2, UE shall send L1-RSRP report including the results for both SSB#0 and SSB#1 while meeting the accuracy requirements defined in clause 10.1.20.1, where X is

- 1680 for UE supporting power class 1
- 1200 for UE supporting power class 2,3 or 4.

The reported L1-RSRP value shall include the Rx antenna gain in the range of  $[-10 \sim +20]$  dB.

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

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.5.6.3.2 SSB based L1-RSRP measurement when DRX is used

# A.5.6.3.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5.4.1, with the testing configurations for NR cells in Table A.5.6.3.2.1-1.

The AoA setup for this test is Setup 1 as defined in clause A.3.15

Table A.5.6.3.2.1-1: Applicable NR configurations for FR2 SSB based L1-RSRP test

Config	Description
1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
3	LTE FDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
4	LTE TDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is onl	y required to be tested in one of the supported test configurations

# A.5.6.3.2.2 Test parameters

There are two cells in the test, E-UTRAN PCell (Cell 1) and FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.5.6.3.2.2-1 and Table A.5.6.3.2.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

Table A.5.6.3.2.2-1: General test parameters

Parameter	Config	Unit	Value
SSB GSCN	1~4		freq1
Duplex mode	1~4		TDD
TDD Configuration	1~4		TDDConf.3.1
BW <sub>channel</sub>	1~4	MHz	100: N <sub>RB,c</sub> = 66
PDSCH Reference measurement channel	1~4		SR.3.1 TDD
RMSI CORESET Reference Channel	1~4		CR.3.1 TDD
Dedicated CORESET Reference Channel	1~4		CCR.3.1 TDD
SSP configuration	1,2		SSB.1 FR2
SSB configuration	3,4		SSB.2 FR2
OCNG Patterns	1~4		OP.1
Initial BWP Configuration	1~4		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~4		DLBWP.1.3 ULBWP.1.3
SMTC configuration	1~4		SMTC.1
TRS Configuration	1~4		TRS.2.1 TDD
PDCCH/PDSCH TCI	1~4		TCI.State.2
Configuration	4 4		DDV 0
DRX configuration	1~4		DRX.3
reportConfigType	1~4		periodic
reportQuantity	1~4		ssb-Index-RSRP
Number of reported RS	1~4		2
L1-RSRP reporting period	1~4	slot	640
T1	1~4	S	5
T2	1~4	S	1
Propagation condition	1~4		AWGN
EPRE ratio of PSS to SSS  EPRE ratio of PBCH DMRS to SSS  EPRE ratio of PBCH to PBCH DMRS  EPRE ratio of PDCCH DMRS to SSS  EPRE ratio of PDCCH to PDCCH DMRS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH to PDSCH DMRS  EPRE ratio of OCNG DMRS to SSSNote 1	1~4	dB	0
EPRE ratio of OCNG to OCNG DMRS Note 1 Propagation condition	1~4		AWGN
	·		

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

Parameter	Config	Unit	SSI	B#0	SSI	3#1	
Parameter	Config	Unit	T1	T2	T1	T2	
Angle of arrival configuration			Setup 1 according to A.3.15.1				
$N_{oc}^{$	1~4	dBm/15kHz		-1	05		
N Note2	1,2	dBm/SSB SCS	-96		96		
$N_{oc}^{}$ Note2	3,4	UDIII/33B 3C3	-93				
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	1~4	dB	0	0	-Infinity	9	
SSB RSRP Note3	1,2	dBm/SSB SCS	-96	-96	-Infinity	-87	
CODITOR	3,4		-93	-93	-Infinity	-84	
lo Note3	1,2	dBm/95.04MHz	-67.5	-67.5	-71.1	-60.7	
10	3,4	ubiii/95.04MHZ	-67.5	-67.5	-71.1	-60.7	
$\hat{E}_s/N_{oc}$	1~4	dB	0	0	-Infinity	9	

Table A.5.6.3.2.2-2: SSB specific test parameters

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

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

Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

#### A.5.6.3.2.3 Test Requirements

The UE shall send L1-RSRP report every 640 slots. No later than X ms plus 640 slots from the beginning of time period T2, UE shall send L1-RSRP report including the results for both SSB#0 and SSB#1 while meeting the accuracy requirements defined in clause 10.1.20.1, where X is

- 2880 for UE supporting power class 1
- 1920 for UE supporting power class 2,3 or 4.

The reported L1-RSRP value shall include the Rx antenna gain in the range of  $[-10 \sim +20]$  dB.

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

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.5.6.3.3 CSI-RS based L1-RSRP measurement when DRX is not used

# A.5.6.3.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5.4.2, with the testing configurations for NR cells in Table A.5.6.3.3.1-1.

Table A.5.6.3.3.1-1: Applicable NR configurations for FR2 CSI-RS based L1-RSRP test

	Config	Description
1		LTE FDD, NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode
2		LTE TDD, NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode
Note:	The UE is only re	equired to be tested in one of the supported test configurations

# A.5.6.3.3.2 Test parameters

There are two cells in the test, E-UTRAN PCell (Cell 1) and FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.5.6.3.3.2-1 and Table A.5.6.3.3.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the CSI-RS and report aperiodically. The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-RSRP on aperiodic CSI-RS resources. UE is also configured to measure L1-RSRP based on SSB. After 160ms from the beginning of the test, the DCI trigger comes in slot 8 of a frame and UE provides the report back based on the reporting configuration as defined in Table A.5.6.3.3.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM and BFD based on the SSBs.

Table A.5.6.3.3.2-1: General test parameters

Parameter	Config	Unit	Value
SSB GSCN	1~2		freq1
Duplex mode	1~2		TDD
TDD Configuration	1~2		TDDConf.3.1
BW <sub>channel</sub>	1~2	MHz	100: N <sub>RB,c</sub> = 66
PDSCH Reference measurement channel	1~2		SR.3.1 TDD
RMSI CORESET Reference Channel	1~2		CR.3.1 TDD
Dedicated CORESET Reference Channel	1~2		CCR.3.1 TDD
SSB configuration	1~2		SSB.1 FR2
CSI-RS configuration	1~2		CSI-RS.3.3 TDD
OCNG Patterns	1~2		OP.1
Initial BWP Configuration	1~2		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~2		DLBWP.1.3 ULBWP.1.3
SMTC configuration	1~2		SMTC.1
TRS Configuration	1~2		TRS.2.1 TDD
PDCCH/PDSCH TCI Configuration	1~2		TCI.State.2
DRX configuration	1~2		Off
reportConfigType	1~2		aperiodic
reportQuantity	1~2		cri-RSRP
Number of reported RS	1~2		2
qcl-Info	1~2		SSB#0 for resource#0 SSB#1 for resource#1
reportSlotOffsetList	1~2		26
Propagation condition	1~2		AWGN
T1	1~2	s	5
EPRE ratio of PSS to SSS  EPRE ratio of PBCH DMRS to SSS  EPRE ratio of PBCH to PBCH DMRS  EPRE ratio of PDCCH DMRS to SSS  EPRE ratio of PDCCH to PDCCH			
DMRS EPRE ratio of PDSCH DMRS to SSS EPRE ratio of PDSCH to PDSCH DMRS EPRE ratio of OCNG DMRS to SSSNote 1 EPRE ratio of OCNG to OCNG DMRS Note 1	1~2	dB	0

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

Parameter	Config	Unit	CSI-RS#0	CSI-RS#1	
Angle of arrival configuration	1~2		Setup 1 according to A.3.15.1		
$N_{oc}^{}$ Note1	1~2	dBm/15kHz	-105		
$N_{oc}^{ m Note1}$	1~2	dBm/SSB SCS	-95.97		
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	1~2	dB	0	9	
CSI-RS RSRP Note2	1~2	dBm/SSB SCS	-95.97	-86.97	
lo <sup>Note2</sup>	1~2	dBm/95.04MHz	-63.97 -57.47		
$\hat{E}_s/N_{oc}$	1~2	dB	0	9	

Table A.5.6.3.3.2-1: CSI-RS specific test parameters

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

Note 3: CSI-RS RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

# A.5.6.3.3.3 Test Requirements

After 160ms from the beginning of the test, the UE shall send L1-RSRP report at slot 26 from the reception of DCI triggering the L1-RSRP measurement. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1 while meeting the accuracy requirements defined in clause 10.1.20.1. The reported L1-RSRP value shall include the Rx antenna gain in the range of  $[-10 \sim +20]$  dB.

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

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.5.6.3.4 CSI-RS based L1-RSRP measurement when DRX is used

#### A.5.6.3.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5.4.2, with the testing configurations for NR cells in Table A.5.6.3.4.1-1.

Table A.5.6.3.4.1-1: Applicable NR configurations for FR2 CSI-RS based L1-RSRP test

	Config	Description
1		LTE FDD, NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode
2		LTE TDD, NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode
Note:	The UE is only re	equired to be tested in one of the supported test configurations

#### A.5.6.3.4.2 Test parameters

There are two cells in the test, E-UTRAN PCell (Cell 1) and FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.5.6.3.4.2-1 and Table A.5.6.3.4.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the CSI-RS and report aperiodically. The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-RSRP on aperiodic CSI-RS resources. UE is also configured to measure L1-RSRP based on SSB. After 480ms from the beginning of the test, the DCI trigger comes in slot 8 of a frame and UE provides the report back based on the reporting configuration as defined in Table A.5.6.3.4.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM and BFD based on the SSBs.

Table A.5.6.3.3.2-1: General test parameters

Parameter	Config	Unit	Value
SSB GSCN	1~2		freq1
Duplex mode	1~2		TDD
TDD Configuration	1~2		TDDConf.3.1
BWchannel	1~2	MHz	100: N <sub>RB,c</sub> = 66
PDSCH Reference measurement channel	1~2		SR.3.1 TDD
RMSI CORESET Reference Channel	1~2		CR.3.1 TDD
Dedicated CORESET Reference Channel	1~2		CCR.3.1 TDD
SSB configuration	1~2		SSB.1 FR2
CSI-RS configuration	1~2		CSI-RS.3.3 TDD
OCNG Patterns	1~2		OP.1
Initial BWP Configuration	1~2		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~2		DLBWP.1.3 ULBWP.1.3
SMTC configuration	1~2		SMTC.1
TRS Configuration	1~2		TRS.2.1 TDD
PDCCH/PDSCH TCI Configuration	1~2		TCI.State.2
DRX configuration	1~2		DRX.3
reportConfigType	1~2		aperiodic
reportQuantity	1~2		cri-RSRP
Number of reported RS	1~2		2
qcl-Info	1~2		SSB#0 for resource#0 SSB#1 for resource#1
reportSlotOffsetList	1~2		26
Propagation condition	1~2		AWGN
T1	1~2	s	5
EPRE ratio of PSS to SSS  EPRE ratio of PBCH DMRS to SSS  EPRE ratio of PBCH to PBCH DMRS  EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS EPRE ratio of PDSCH DMRS to SSS	1~2	dB	0
EPRE ratio of PDSCH to PDSCH DMRS EPRE ratio of OCNG DMRS to			
SSS <sup>Note 1</sup> EPRE ratio of OCNG to OCNG			
DMRS Note 1			

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

Parameter	Config	Unit	CSI-RS#0	CSI-RS#1	
Angle of arrival configuration	1~2		Setup 1 according to A.3.15.1		
$N_{oc}^{}$ Note1	1~2	dBm/15kHz	-105		
$N_{oc}^{}$ Note1	1~2	dBm/SSB SCS	-95.97		
$\hat{\mathrm{E}}_{\scriptscriptstyle \mathrm{s}}/\mathrm{I}_{\scriptscriptstyle \mathrm{ot}}$	1~2	dB	0 9		
CSI-RS RSRP Note2	1~2	dBm/SSB SCS	-95.97	-86.97	
lo <sup>Note2</sup>	1~2	dBm/95.04MHz	-63.97	-57.47	
$\hat{E}_s/N_{oc}$	1~2	dB	0	9	

Table A.5.6.3.3.2-1: CSI-RS specific test parameters

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

Note 3: CSI-RS RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

#### A.5.6.3.3.3 Test Requirements

After 480ms from the beginning of the test, the UE shall send L1-RSRP report at slot 26 from the reception of DCI triggering the L1-RSRP measurement. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1 while meeting the accuracy requirements defined in clause 10.1.20.1. The reported L1-RSRP value shall include the Rx antenna gain in the range of  $[-10 \sim +20]$  dB.

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

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.5.7 Measurement Performance requirements

# A.5.7.1 SS-RSRP

# A.5.7.1.1 EN-DC intra-frequency case measurement accuracy with FR2 serving cell and FR2 target cell

#### A.5.7.1.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 10.1.2.1.1 and 10.1.2.1.1 for intra-frequency measurements.

#### A.5.7.1.1.2 Test parameters

In this set of test cases, all NR cells are on the same carrier frequency. Supported test configurations are shown in Table A.5.7.1.1.2-1. Both absolute and relative accuracy of SS-RSRP intra-frequency measurements are tested by using the parameters in Table A.5.7.1.1.2-2 and A.5.7.1.1.2-3. The E-UTRA PCell is configured as specified in clause A.3.7.2.2. In all test cases, Cell 1 is the PCell, cell 2 is the PSCell and Cell 3 is the target cell. The test consists of two time phases T1 and T2.

Table A.5.7.1.1.2-1: SS-RSRP Intra frequency SS-RSRP supported test configurations

Configuration Description		
1		FDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2		TDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note:	The UE is only re	equired to pass in one of the supported test configurations

Table A.5.7.1.1.2-2: SS-RSRP Intra frequency general test parameters

Parameter <sup>Note 5</sup>	Unit	Т	T1		T2	
Parameter	Offic	Cell 2	Cell 3	Cell 2	Cell 3	
Physical cell ID		489	0	489	0	
SSB ARFCN		fre	q1	freq1		
Duplex mode		TE	DD	TE	DD	
TDD configuration		TDDC	onf.3.1	TDDC	onf.3.1	
BW <sub>channel</sub>	MHz		<sub>RB,c</sub> = 24		$R_{B,c} = 24$	
PDSCH Reference measurement channel		SR.3.1	_	SR.3.1	_	
T BOOTT Reference measurement charmer		TDD		TDD		
		CR.3.1		CR.3.1		
RMSI CORESET Reference Channel		TDD	-	TDD	-	
		CCR.3.		CCR.3.		
Dedicated CORESET Reference Channel		1 TDD	-	1 TDD	-	
OCNG Patterns		OP.3	OP.3	OP.3	OP.3	
		SSB.1	SSB.1	SSB.1	SSB.1	
SSB configuration		FR2	FR2	FR2	FR2	
		SMTC.	SMTC.	SMTC.	SMTC.	
SMTC configuration		1	1	1	1	
Time offset with Cell 2	μS	-	3	-	3	
PDSCH/PDCCH subcarrier spacing	kHz	120	120	120	120	
EPRE ratio of PSS to SSS						
EPRE ratio of PBCH_DMRS to SSS	]					
EPRE ratio of PBCH to PBCH_DMRS	]					
EPRE ratio of PDCCH_DMRS to SSS	]					
EPRE ratio of PDCCH to PDCCH_DMRS	dB	0	0	0	0	
EPRE ratio of PDSCH_DMRS to SSS	ub	0			U	
EPRE ratio of PDSCH to PDSCH_DMRS						
EPRE ratio of OCNG DMRS to SSSNote 1						
EPRE ratio of OCNG to OCNG DMRS Note						
Propagation conditions		AWGN	AWGN	AWGN	AWGN	
Antenna configuration		1x2	1x2	1x2	1x2	
Nists 4: OONO shall be seed such that he				44-4-1		

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

Note 2: Void Note 3: Void

Note 4: Void

Note 5: All parameters apply for configuration 1 and 2

Note 6: Void

Table A.5.7.1.1.2-3: SS-RSRP Intra frequency OTA related test parameters

Davana	-4	Unit	Т	1	Т	2
	Parameter		Cell 2	Cell 3	Cell 2	Cell 3
Angle of a				to clause	According to clause	
configura	tion	-ID /4.EL-L	A.3.	15.1	A.3.	15.1
$N_{oc}$ Note1		dBm/15kH z <sup>Note4</sup>	-9 <sup>-</sup>	1.6	N	/A
$N_{oc}$ Note1		dBm/SCS Note4	-82	2.6	N	/A
$\hat{E}_s/N_{oc}$	;	dB	6.0	1.0	N/A	N/A
Es		dBm/SCS Note4			(Table B.2.2-2 Rx Beam Peak +3.1dB)	(Table B.2.2-2 Rx Beam Peak +3.1dB)
SSB_RP <sup>t</sup>	Note2	dBm/SCS	-76.6	-81.6	(Table B.2.2-2 Rx Beam Peak +3.1dB)	(Table B.2.2-2 Rx Beam Peak +3.1dB)
$\hat{\mathrm{E}}_{_{\mathrm{s}}}/\mathrm{I}_{_{\mathrm{ot}}}$ be	Note6	dB	2.44	-5.98	-5.98	-5.98
Io <sup>Note2</sup>		dBm/95.04 MHz <sup>Note4</sup>	-50	.05	(Table B Beam Peak	.2.2-2 Rx ( +30.70dB)
Note 1:		used, interfered and in the test is				
	and sha	all be modelle	d as AWGN o	of appropriate	power for  N	$_{oc}$ to be
Note 2: Note 3: Note 4: Note 5: Note 6:	fulfilled.  SSB_RP, Es/lot and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves. Void  Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Void  Calculation of Es/lot <sub>BB</sub> includes the effect of UE internal noise up to the					
Note 7:	value assumed for the associated Refsens requirement in clause 7.3.2 of TS 36.101-2 [19], and an allowance of 2dB for UE multi-band relaxation factor $\Sigma$ MB <sub>P</sub> from TS 38.101-2 [19] Table 6.2.1.3-4. All parameters apply for configurations 1 and 2					

# A.5.7.1.1.3 Test Requirements

The SS-RSRP measurement accuracy shall fulfil the absolute accuracy requirements in clauses 10.1.3.1.1 and relative accuracy requirements in clause 10.1.3.1.2. The following requirements are to be verified:

#### During T1:

Absolute accuracy of Cell 2 and absolute accuracy of Cell 3. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in table A.5.7.1.1.3-1.

Relative accuracy of Cell 3 compared with Cell 2. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 10.1.3.1.2-1.

#### During T2:

Absolute accuracy of Cell 2 and absolute accuracy of Cell 3. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in table A.5.7.1.1.3-1.

Relative accuracy of Cell 3 compared with Cell 2. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 10.1.3.1.2-1.

#### During T1 and T2:

Relative accuracy of Cell 2 during T2 compared with Cell 2 during T1. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 10.1.3.1.2-1

Relative accuracy of Cell 3 during T2 compared with Cell 3 during T1. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 10.1.3.1.2-1.

Table A.5.7.1.1.3-1: SS-RSRP absolute accuracy test requirement for different UE power classes

UE power class	Test requirement Note1.2
1	SSB_RP-TBD-δ-≤Reported RSRP(dB)≤
	SSB_RP+TBD+ δ dB
2	SSB_RP-TBD-δ-≤Reported RSRP(dB)≤
	SSB_RP+TBD+ δ dB
3	SSB_RP-22.6-δ-≤Reported RSRP(dB)≤
	SSB_RP+[20]+ δdB
4	SSB_RP-TBD-δ-≤Reported RSRP(dB)≤
	SSB_RP+TBD+ δ dB

Note 1: SSB\_RP is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the cell under consideration

Note 2:  $\delta$  is the RSRP absolute accuracy requirement from table 10.1.3.1.1-1, e.g. if the requirement corresponding to the lo used in the test is  $\pm 6dB$ ,  $\delta = 6$  and if the requirement corresponding to the lo used in the test is  $\pm 8dB$ ,  $\delta = 8$ 

# A.5.7.1.2 EN-DC inter-frequency case measurement accuracy with FR2 serving cell and FR2 target cell

#### A.5.7.1.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 10.1.5.1.1 and 10.1.5.1.2 for inter-frequency measurements with the testing configurations for NR cells in Table A.5.7.1.2.1-1.

Table A.5.7.1.2.1-1: Applicable NR configurations for FR2 inter-frequency SS-RSRP accuracy test

Configuration	Description
1	FDD LTE PCell, cells 2&3 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2	TDD LTE PCell, cells 2&3 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
3	FDD LTE PCell, cells 2&3 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
4	TDD LTE PCell, cells 2&3 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode

# A.5.7.1.2.2 Test parameters

In this set of test cases, there are three cells in the test, E-UTRAN PCell (Cell 1), FR2 PSCell (Cell 2) and a FR2 neighbour cell (Cell 3) on a different frequency than the PSCell. The test parameters and applicability for Cell 1 are

defined in A.3.7.2. The test parameters for the Cell 2 and Cell 3 are given in Table A.5.7.1.2.2-1 and Table A.5.7.1.2.2-2 below. Both absolute and relative accuracy of RSRP inter-frequency measurements are tested by using the parameters in Table A.5.7.1.2.2-1 and Table A.5.7.1.2.2-2. The inter-frequency measurements are supported by a measurement gap.

Table A.5.7.1.2.2-1: SS-RSRP inter-frequency test parameters

Parameter	Config	Unit	Test 1		Test 2		
1 0.11 0.11 10 00 1	Config	Unit	Cell 2 Cell 3		Cell 2	Cell 3	
SSB ARFCN	1~4		freq1	freq2	freq1	freq2	
BW <sub>channel</sub>	1~4			00:	100: N <sub>RB,c</sub> = 24		
	1~4		TDD	$N_{RB,c} = 24$ TDD TDD		= 24 TDD	
Duplex mode					TDD		
TDD configuration	1~4		IDDC	onf.3.1	TDDC	ont.3.1	
PDSCH Reference measurement channel	1~4		SR.3.1 TDD	-	SR.3.1 TDD	-	
RMSI CORESET Reference Channel	1~4		CR.3.1 TDD	-	CR.3.1 TDD	-	
Dedicated CORESET Reference Channel	1~4		CCR.3.1 TDD	-	CCR.3.1 TDD	-	
SSB configuration	1,2			1 FR2		1 FR2	
	3,4			2 FR2		2 FR2	
OCNG Patterns	1~4			P.3		P.3	
Initial BWP Configuration	1~4			VP.0.1 VP.0.1	DLBWP.0.1 ULBWP.0.1		
Dedicated BWP configuration	1~4		ULBV	/P.1.3 /P.1.3	DLBWP.1.3 ULBWP.1.3		
TRS Configuration	1~4		TRS.2.1 TDD		TRS.2.1 TDD		
PDCCH/PDSCH TCI Configuration	1~4		TCI.State.2		TCI.State.2		
SMTC configuration	1~4		SMT	ΓC.1	SMTC.1		
Time offset between Cell 2 and Cell 3	1~4	μs	;	3	3		
EPRE ratio of PSS to SSS  EPRE ratio of PBCH DMRS to SSS  EPRE ratio of PBCH to PBCH DMRS  EPRE ratio of PDCCH DMRS to SSS  EPRE ratio of PDCCH to PDCCH DMRS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH to PDSCH DMRS  EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup> EPRE ratio of OCNG to OCNG DMRS Note 1	1~4	dB	0	0	0	0	
Propagation condition	1~4	_	AWGN	AWGN	AWGN	AWGN	
Antenna configuration	1~4	_	1x2	1x2	1x2	1x2	

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

Note 2: Void

Table A.5.7.1.2.2-2: SS-RSRP inter-frequency OTA related test parameters

Doromotor	Unit	Tes	st 1	Tes	st 2
Parameter	Unit	Cell 2	Cell 3	Cell 2	Cell 3
Angle of arrival		According to clause A.3.15.4.2			
configuration		Spherical coverage	Rx Beam Peak	Spherical coverage	Rx Beam Peak
$N_{oc}^{}$ Note1	dBm/15kH z <sup>Note4</sup>	-90.6	-90.6	(Table B.2.3-2 Rx Beam Peak +1.97dB)	(Table B.2.3-2 Rx Beam Peak - 3.03dB)
$N_{oc}^{}$ Note1	dBm/SCS Note4	-81.6	-81.6	(Table B.2.3-2 Rx Beam Peak +11.0dB)	(Table B.2.3-2 Rx Beam Peak +6.0dB)
$\hat{E}_s/N_{oc}$	dB	6.0	6.0	17.0	-1.0
SSB_RPNote2	dBm/SCS	-75.60	-75.60	(Table B.2.3-2 Rx Beam Peak +28.0dB)	(Table B.2. 3-2 Rx Beam Peak +5.0dB)
(SSB_RP <sub>Cell 1</sub> - SSB_RP <sub>Cell 2</sub> )	dB	(	)	23	.00
$\hat{E}_{_{s}}/I_{_{ot}}$ BB Note6	dB	5.29	5.96	8.86	-3.92
Io <sup>Note2</sup>	dBm/95.04 MHz <sup>Note4</sup>	-50.03	-50.03	(Table B.2.3-2 Rx Beam Peak +52.68dB)	(Table B.2.3-2 Rx Beam Peak +33.13dB)
(lofreq 1 - lo freq 2)	dB	(	)	19	.55

- Note 1: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.
- Note 2: SSB\_RP, Es/lot, Io, (SSB\_RPCell 2 SSB\_RPCell 1) and (Iofreq 2 Io freq 1) levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 3: Void
- Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
- Note 5: Void
- Note 6: Calculation of Es/lot<sub>BB</sub> includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 36.101-2 [19], and an allowance of 2dB for UE multi-band relaxation factor  $\Sigma$  MB<sub>P</sub> or  $\Sigma$  MB<sub>S</sub> from TS 38.101-2 [19] Table 6.2.1.3-4.

# A.5.7.1.2.3 Test Requirements

The SS-RSRP measurement accuracy for Cell 2 and Cell 3 shall fulfil the requirements in clauses 10.1.5.1.1 and 10.1.5.1.2.

Test 1:

Absolute accuracy of Cell 1 and absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table A.5.7.1.2.3-1.

Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in A.5.7.1.2.3-2.

#### Test 2:

Absolute accuracy of Cell 1 and absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table A.5.7.1.2.3-1.

Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in A.5.7.1.2.3-2s.

Table A.5.7.1.2.3-1: SS-RSRP absolute accuracy test requirement for different UE power classes [FFS]

Table A.5.7.1.2.3-2: SS-RSRP relative accuracy test requirement for different UE power classes [FFS]

# A.5.7.1.3 EN-DC inter-frequency measurement accuracy with FR1 serving cell and FR2 target cell

#### A.5.7.1.3.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 10.1.5.1.1 for inter-frequency measurements with the testing configurations in Table A.5.7.1.3.1-1.

Table A.5.7.1.3.1-1: Applicable NR configurations for FR2 inter-frequency SS-RSRP accuracy test

Config	Description of serving cell	Description of target cell				
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz					
	bandwidth, FDD duplex mode					
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz					
	bandwidth, TDD duplex mode					
3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz					
	bandwidth, TDD duplex mode	120 kHz SSB SCS, 100 MHz				
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz	bandwidth, TDD duplex mode				
	bandwidth, FDD duplex mode					
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz					
	bandwidth, TDD duplex mode					
6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz					
	bandwidth, TDD duplex mode					
Note: The U	Note: The UE is only required to be tested in one of the supported test configurations					

#### A.5.7.1.3.2 Test parameters

In this set of test cases there are three cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR2 neighbour cell (Cell 3) on a different frequency than the PSCell. The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 and Cell 3 are given in Table A.5.7.1.3.2-1 and Table A.5.7.1.3.2-2 below. Both absolute and relative accuracy of RSRP inter-frequency measurements are tested by using the parameters in Table A.5.7.1.3.2-1 and Table A.5.7.1.3.2-2. The inter-frequency measurements are supported by a measurement gap.

Table A.5.7.1.3.2-1: SS-RSRP inter-frequency test parameters

Doromotor	Config	Unit	Tes	st 1	Test 2		
Parameter	Config	Unit	Cell 2	Cell 3	Cell 2	Cell 3	
SSB ARFCN	1~6		freq1	freq2	freq1	freq2	
	1,4		10:		10:		
			N <sub>RB,c</sub> = 52 10:	100:	N <sub>RB,c</sub> = 52 10:	100:	
BW <sub>channel</sub>	2,5	MHz	N <sub>RB,c</sub> = 52	N <sub>RB,c</sub> = 66	N <sub>RB,c</sub> = 52	N <sub>RB,c</sub> = 66	
	3,6		40:		40:		
Can nattarn ID	0,0		N <sub>RB,c</sub> = 106		N <sub>RB,c</sub> = 106	<u> </u>	
Gap pattern ID	1,4		FDD	)	FDD		
Duplex mode	2,5		TDD	TDD	TDD	TDD	
Bapiex mode	3,6		TDD	100	TDD	100	
	1,4		N/A		N/A		
			TDDConf.	TDDConf.	TDDConf.	TDDConf.	
TDD configuration	2,5		1.1	3.1	1.1	3.1	
	3,6		TDDConf.	5.1	TDDConf.	3.1	
	· ·		2.1		2.1		
PDSCH Reference	1,4		SR.1.1 FDD		SR.1.1 FDD		
measurement channel	2,5		SR.1.1 TDD	-	SR.1.1 TDD	-	
	3,6 1,4		SR.2.1 FDD CR.1.1 FDD	-	SR.2.1 FDD CR.1.1 FDD	-	
RMSI CORESET	2,5		CR.1.1 TDD	_	CR.1.1 TDD	-	
Reference Channel	3,6		CR.2.1 FDD		CR.2.1 FDD	_	
- II / 100====	1,4		CCR.1.1 FDD	_	CCR.1.1 FDD	_	
Dedicated CORESET	2,5		CCR.1.1 TDD	-	CCR.1.1 TDD	-	
Reference Channel	3,6		CCR.2.1 TDD	-	CCR.2.1 TDD	-	
	1,4		SSB.1		SSB.1		
	1,7		FR1		FR1		
SSB configuration	2,5		SSB.1	SSB.1 FR2	SSB.1	SSB.1 FR2	
	, -		FR1		FR1		
	3,6		SSB.2 FR1		SSB.2 FR1		
OCNG Patterns	1~6		OF	P.1	OP.1		
Initial BWP				/P.0.1	DLBWP.0.1		
Configuration	1~6			/P.0.1	ULBWP.0.1		
Dedicated BWP	1~6			/P.1.3	DLBWP.1.3		
configuration	_			/P.1.3	ULBWP.1.3		
TRS Configuration	1~6		TRS.2	.1 TDD	TRS.2.1 TDD		
PDCCH/PDSCH TCI	1~6		TCI.S	tate.2	TCI.S	tate.2	
Configuration			0.4		0.15		
SMTC configuration	1~6		SM	ΓC.1	SMI	ΓC.1	
Time offset between	1~6	μs	3		3	3	
Cell 2 and Cell 3	. •	μυ		-		-	
EPRE ratio of PSS to SSS EPRE ratio of PBCH							
DMRS to SSS							
EPRE ratio of PBCH to	1						
PBCH DMRS							
EPRE ratio of PDCCH DMRS to SSS							
EPRE ratio of PDCCH to PDCCH DMRS	1~6	dB	0	0	0	0	
EPRE ratio of PDSCH	1						
DMRS to SSS	<u> </u>						
EPRE ratio of PDSCH to							
PDSCH DMRS EPRE ratio of OCNG	1						
DMRS to SSS <sup>Note 1</sup>							

EPRE ration	o of OCNG to MRS <sup>Note 1</sup>						
Propaga	ation condition	1~6	-	NA	AWGN	NA	AWGN
Antenna	a configuration	1~6	-	Link only, see clause A.3.7A	1x2	Link only, see clause A.3.7A	1x2
Note 1:	Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.						
Note 2:	·						
	for $N_{oc}$ to be	fulfilled.					

Table A.5.7.1.3.2-2: SS-RSRP inter-frequency OTA related test parameters

Doromotor	Davameter Confin		Tes	st 1	Test 2 NOTE 3	
Parameter	Config	Unit	Cell 2	Cell 3	Cell 2	Cell 3
$N_{oc}$	1~4	dBm/15 kHz		TBD		NA
$N_{oc}$	1,2	dBm/SS	1	TBD	]	NA
000	3,4	B SCS		TBD		NA
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	1~4	dB		TBD		NA
SS-RSRPNote1	1,2	dBm/SC	NA Link only, see	TBD	NA Link only, see	As in Table B.2.3-2
33-N3NF ****	3,4	S	clause A.3.7A	TBD	clause A.3.7A	As in Table B.2.3-2
Io <sup>Note1</sup>	1~4	dBm/ 95.04M Hz		TBD		SS- RSRP+ 28.98
$\hat{E}_s/N_{oc}$	1~4	dB		TBD		NA

Note 1: RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 3: No additional noise is added by the test system in Test 2.

# A.5.7.1.3.3 Test Requirements

The SS-RSRP measurement accuracy for Cell 3 shall fulfil the Absolute requirement in clause 10.1.5.1.1.

# A.5.7.2 SS-RSRQ

# A.5.7.2.1 EN-DC Intra-frequency measurement accuracy with FR2 serving cell and FR2 TDD target cell

# A.5.7.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.8.1.1.

#### A.5.7.2.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configurations are shown in Table A.5.7.2.1.2-1. The absolute accuracy of SS-RSRQ intra-frequency measurement is test by using the parameters in

Table A.5.7.2.1.2-2 and Table A.5.7.2.1.2-3. The configuration of cell 1 (E-UTRA PCell) is specified in clause A.3.7.2.1. In all test cases, Cell 2 is the PSCell and Cell 3 is the target cell.

Table A.5.7.2.1.2-1: SS-RSRQ Intra frequency SS-RSRQ supported test configurations

Con	figuration	Description
1		FDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2		TDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note:	The UE is only re	equired to pass in one of the supported test configurations

Table A.5.7.2.1.2-2: SS-RSRQ Intra frequency test parameters

D	Parameter		Test		Test 2	
Par			Cell 2	Cell 3	Cell 2	Cell 3
SSB ARFCN			Fred	ղ1	Freq1	
Duplex mode			TDI		TDD	
TDD configuration			TDDCo		TDDC	
BW <sub>channel</sub>		MHz	100: N <sub>RB</sub>	$_{\rm s,c} = 66$	100: N <sub>F</sub>	<sub>RB,c</sub> = 66
	Initial DL BWP				NP.0.1	
BWP configuration	Dedicated DL BWP				NP.1.1	
DWI Comiguration	Initial UL BWP				NP.0.1	
	Dedicated UL BWP			ULB\	NP.1.1	
TRS configuration			TRS.2.1		TRS.2.1	
Tito configuration			TDD		TDD	
TCI state			TCI.State		TCI.State	ļ
10101010			.0		.0	
PDSCH Reference	measurement channel		SR.3.1		SR.3.1	
			TDD		TDD	
RMSI CORESET R	eference Channel		CR.3.1	-	CR.3.1	_
Thirte Contact I telefolice Chains			TDD		TDD	
Control channel RM	IC		CCR.3.1	-	CCR.3.1	-
OCNG Patterns	OCNIC Detterne		OP.1	OP.1	TDD OP.1	OP.1
SMTC configuration			SMTC.1			OF.1
	l		SSB.1 SSB.1 SSB.1		SSB.1	
SSB configuration			FR2	FR2	FR2	FR2
PDSCH/PDCCH su	hearrier spacing	kHz	120	120	120	120
SS-RSSI-Measuren		KI IZ	Not Applicable			120
EPRE ratio of PSS				110171		
EPRE ratio of PBCI						
EPRE ratio of PBCI						
EPRE ratio of PDC	_					
	CH to PDCCH DMRS		_	_	_	
EPRE ratio of PDSCH DMRS to SSS		dB	0	0	0	0
	EPRE ratio of PDSCH to PDSCH_DMRS					
	G DMRS to SSSNote 1					
EPRE ratio of OCN	G to OCNG DMRS Note 1					
$\hat{E}_s/N_{oc}$		dB	3	3	-3	-3

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

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for

 $N_{oc}$  to be fulfilled.

Note 3: SS-RSRQ, SS-RSRP, and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRQ and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: Void

Table A.5.7.2.1.2-3: SS-RSRQ Intra frequency OTA related test parameters

Parameter	Unit	Tes	st 1	Test 2 Cell 2 Cell 3		
r ai ailletei	Offic		Cell 2 Cell 3		Cell 3	
Angle of arrival configuration		Accord	ding to	According	to clause	
		clause A	A.3.15.1	A.3.15.1		
$N_{oc}$ Note1	dBm/15kHz <sup>N</sup> ote4	<u>-</u> 9	-95		95	
$N_{oc}^{}$ Note1	dBm/SCS <sup>Note</sup>	-86		-86		
SS-RSRP <sup>Note2</sup>	dBm/SCS Note4	-83	-83	-89	-89	
SS-RSRQ <sup>Note2</sup>	dB	-14.77 -14.77		-16.81	-16.81	
$\hat{E}_{s}/I_{ot}$	dB	-1.76	-1.76	-4.76	-4.76	
Io <sup>Note2</sup>	dBm/95.04 MHz <sup>Note4</sup>	-50		54	-54	

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 2: SS-RSRQ, SS-RSRP, and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 3: SS-RSRQ and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone

Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone

Note 6: NR operating band groups are as defined in Clause 3.5.2.

Note 7: Void Note 8: Void

# A.5.7.2.1.3 Test Requirements

The SS-RSRQ absolute measurement accuracy in test 1 shall be within the range Nominal SS-RSRQ+2.5dB to Nominal SS-RSRQ -3.5dB and the SS-RSRQ measurement accuracy in test 2 shall be within the range Nominal SS-RSRQ +3.5dB to Nominal SS-RSRQ -4.5dB according to the requirements in clause 10.1.8.1.1 with an additional -1dB margin reflecting the possible impact of UE self noise in the test. Nominal SS-RSRQ is the value shown in table A.5.7.2.1.2-3. The SS-RSRQ relative measurement accuracy shall meet the requirements in clause 10.1.8.1.1.

# A.5.7.2.2 EN-DC Inter-frequency measurement accuracy with FR2 serving cell and FR2 TDD target cell

#### A.5.7.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.9.1.1 and 10.1.9.1.2 for inter-frequency measurement.

#### A.5.7.2.2.2 Test Parameters

In this test case the two NR cells (i.e., Cell 2 and Cell 3) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table A.5.7.2.2.2-1. Both absolute accuracy and relative accuracy requirements of SS-RSRQ inter-frequency measurement are tested by using test setup in Table A.5.7.2.2.2-2 and Table A.5.7.2.2.2-3. In all test cases, Cell 2 is the PSCell and Cell 3 is target cell. Cell 1 is the E-UTRA cell which specific test parameters for this test case are specified in Table A.3.7.2.1-1.

Table A.5.7.2.2.2-1: SS-RSRQ Inter frequency SS-RSRQ supported test configurations

Configuration	Description
1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode

Table A.5.7.2.2-2: SS-RSRQ Inter frequency general test parameters

Dovometer	Unit	Tes	st 1	Test 2		
Parameter	Offic	Cell 2	Cell 3	Cell 2	Cell 3	
SSB ARFCN		Freq1	freq2	freq1	Freq2	
Duplex mode		TE	DD	T	DD	
TDD configuration		TDDC	onf.3.1	TDDC	onf.3.1	
BW <sub>channel</sub>	MHz	100: N <sub>F</sub>	$R_{B,c} = 66$	100: N <sub>F</sub>	$R_{B,c} = 66$	
PDSCH Reference measurement channel		SR.3.1 TDD	_	SR.3.1 TDD	-	
RMSI CORESET Reference Channel		CR.3.1 TDD	-	CR.3.1 TDD	-	
OCNG Patterns		OP.1	OP.1	OP.1	OP.1	
SMTC configuration		SMTC. 1 FR2	SMTC. 1 FR2	SMTC. 1 FR2	SMTC. 1 FR2	
PDSCH/PDCCH subcarrier spacing	kHz	120	120	120	120	
EPRE ratio of PSS to SSS						
EPRE ratio of PBCH_DMRS to SSS						
EPRE ratio of PBCH to PBCH_DMRS						
EPRE ratio of PDCCH_DMRS to SSS	dB	0	0	0	0	
EPRE ratio of PDCCH to PDCCH_DMRS	uБ		0		U	
EPRE ratio of PDSCH_DMRS to SSS						
EPRE ratio of PDSCH to PDSCH_DMRS						
EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>						
$\hat{E}_s/N_{oc}$	dB	-1.75	-1.75	-3	-3	

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

Table A.5.7.2.2.2-3: SS-RSRQ Inter frequency OTA related test parameters

Doromotor	l lmi4	Tes	st 1	Test 2	
Parameter	Unit	Cell 2	Cell 3	Cell 2	Cell 3

AoA setup		Setup 1 in clause Setup 1 in in clause A.3.15			in clause e A.3.15	
$N_{oc}^{$	dBm/15kHz <sup>N</sup> ote4	-94.03		-94	.03	
$N_{oc}^{$	dBm/SCS <sup>Note</sup>	-85.0		-85.0		5.0
SSB_RP <sup>Note2</sup>	dBm/SCS Note4	-86.75 -86.75		-88	-88	
SS-RSRQ <sup>Note2</sup>	dB	-14.75	-14.75	-15.56	-15.56	
$\hat{E}_{s}/I_{ot}$	dB	-1.75	-1.75	-3	-3	
Io <sup>Note2</sup> Note 1: Interference from other cells and	dBm/95.04 MHz <sup>Note4</sup>	-53.8	-53.8	-54.25	-54.25	

- Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.
- Note 2: SS-RSRQ, SSB\_RP, and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 3: SS-RSRQ and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
- Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone
- Note 6: Void
- Note 7: Void

# A.5.7.2.2.3 Test Requirements

The SS-RSRQ absolute measurement accuracy in test 1 shall be within the range Nominal SS-RSRQ+2.5dB to Nominal SSRQ-3.5dB and the SS-RSRQ measurement accuracy in test 2 shall be within the range Nominal SS-RSRQ+3.5dB to Nominal SS-RSRQ-4.5dB according to the requirements in clause 10.1.10.1.1 with an additional -1dB margin reflecting the possible impact of UE self noise in the test.

The SS-RSRQ relative measurement accuracy shall fulfil the requirements in clause 10.1.10.1.2.

# A.5.7.3 SS-SINR

# A.5.7.3.1 EN-DC Intra-frequency measurement accuracy with FR2 serving cell and FR2 TDD target cell

# A.5.7.3.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.13.1.1.

#### A.5.7.3.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configurations are shown in Table A.5.7.3.1.2-1. The absolute accuracy of SS-SINR intra-frequency measurement is test by using the parameters in Table A.5.7.3.1.2-2 and Table A.5.7.3.1.2-3. The configuration of cell 1 (E-UTRA PCell) is specified in clause A.3.7.2.1. In all test cases, Cell 2 is the PSCell and Cell 3 is the target cell.

Table A.5.7.3.1.2-1: SS-SINR Intra frequency SS-SINR supported test configurations

Conf	figuration	Description				
1		FDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode				
2		TDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode				
Note:	The UE is only re	equired to pass in one of the supported test configurations				

Table A.5.7.3.1.2-2: SS-SINR Intra frequency test parameters

Parameter	Unit		st 1		Test 2		
Parameter	Onit	Cell 2	Cell 3	Cell 2	Cell 3		
SSB ARFCN		Freq2			Freq2		
Duplex mode		TDD TDE			)D		
TDD configuration		TDDC	onf.3.1	TDDC	onf.3.1		
BW <sub>channel</sub>	MHz	100: N <sub>F</sub>	$_{RB,c} = 66$	100: N <sub>F</sub>	$_{RB,c} = 66$		
Downlink initial BWP configuration				VP.0.1			
Downlink dedicated BWP configuration				VP.1.1			
Uplink initial BWP configuration				VP.0.1			
Uplink dedicated BWP configuration				VP.1.1			
DRX cycle configuration	ms		Not ap	plicable			
TRS configuration				.1 TDD			
TCI state				State.0			
AoA setup			etup 3 defi	ned in A.3.	15		
PDSCH Reference measurement channel		SR.3.1		SR.3.1			
1 BOOT Reference measurement charmer		TDD		TDD			
RMSI CORESET Reference Channel		CR.3.1	_	CR.3.1	_		
		TDD	-	TDD	_		
Dedicated RMSI CORESET Reference		CCR.3	_	CCR.3.	_		
Channel		.1 TDD		1 TDD			
OCNG Patterns		OP.1	OP.1	OP.1	OP.1		
SMTC configuration				TC.1			
SSB configuration		SSB.1	SSB.1	SSB.1	SSB.1		
		FR2	FR2	FR2	FR2		
PDSCH/PDCCH subcarrier spacing	kHz	120	120	120	120		
SS-RSSI-Measurement			Not Ap	plicable			
EPRE ratio of PSS to SSS							
EPRE ratio of PBCH_DMRS to SSS							
EPRE ratio of PBCH to PBCH_DMRS							
EPRE ratio of PDCCH_DMRS to SSS							
EPRE ratio of PDCCH to PDCCH_DMRS	dB	0	0	0	0		
EPRE ratio of PDSCH_DMRS to SSS			· ·				
EPRE ratio of PDSCH to PDSCH_DMRS							
EPRE ratio of OCNG DMRS to SSSNote 1							
EPRE ratio of OCNG to OCNG DMRS Note 1							
$\hat{E}_s/N_{oc}$	dB	4.54	2.66	-3	-3		

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

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

Note 3: SS-SINR, SS-RSRP, and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-SINR and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Table A.5.7.3.1.2-3: SS-SINR Intra frequency OTA related test parameters

Parameter Unit Test 1 To							
	Parameter	Onit	Cell 2	Cell 3	Cell 2 Cell 3		
Angle of a	arrival configuration			ding to	According to clause A.3.15.1		
			clause /	A.3.15.1	clause A	A.3.15.1	
$N_{oc}^{$		dBm/15kHz Note4	-1	05	-105		
$N_{oc}^{$		dBm/SCS Note3	-9	96	-96		
SS-RSRF	oNote2	dBm/SCS Note4	-91.46	-91.46 -93.34		-99	
SS-SINR Note2		dB	0	-3.2	-4.76	-4.76	
$\hat{E}_{s}/I_{ot}$		dB	0	-3.2	-4.76	-4.76	
Io <sup>Note2</sup>		dBm/95.04 MHz <sub>Note4</sub>		9.2	-6		
Note 1:	Interference from other cells and constant over subcarriers and tim for $N_{oc}$ to be fulfilled.						
Note 2:	SS-SINR, SS-RSRP, and lo level				meters for		
information purposes. They are not settable parameters themselves.  Note 3: SS-SINR and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone							
Note 5:	As observed with 0dBi gain anten			et zone			
Note 6: Note 7:	NR operating band groups are as Void	defined in Clau	se 3.5.2.				
Note 7:	Void						

# A.5.7.3.1.3 Test Requirements

The SS-SINR absolute measurement accuracy in test 1 shall be within the range Nominal SS-SINR+3B to Nominal SS-SINR -4dB and the SS-SINR measurement accuracy in test 2 shall be within the range Nominal SS-SINR +3.5dB to Nominal SS-SINR -4.5dB according to the requirements in clause 10.1.10.13.1 with an additional -1dB margin reflecting the possible impact of UE self noise in the test. Nominal SS-SINR is the value shown in table A.5.7.3.1.2-3.

The SS-SINR relative measurement accuracy shall fulfil the requirements in clause 10.1.13.1.1.

# A.5.7.3.2 EN-DC Inter-frequency measurement accuracy with FR2 serving cell and FR2 TDD target cell

### A.5.7.3.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.15.1.1 and 10.1.15.1.2 for inter-frequency measurement.

#### A.5.7.3.2.2 Test Parameters

In this test case the two NR cells (i.e., Cell 2 and Cell 3) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table A.5.7.3.2.2-1. Both absolute accuracy and relative accuracy requirements of SS-SINR inter-frequency measurement are tested by using test setup in Table A.5.7.3.2.2-2 and Table A.5.7.3.2.2-3. In all test cases, Cell 2 is the PSCell and Cell 3 is target cell. Cell 1 is the E-UTRA cell which specific test parameters for this test case are specified in Table A.3.7.2.1-1. The TCI status for Cell 1 is defined in Table A.3.16.2-1 and TRS configuration for Cell 1 is defined in Table A.3.17.2.1-1.

Table A.5.7.2.2.2-2: SS-SINR Inter frequency SS-SINR supported test configurations

Configuration	Description
1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode

Table A. 5.7.2.2.2-2: SS-SINR Inter frequency general test parameters

Daramatar	Unit	Tes	t 1	Tes	st 2	Tes	st 3
Parameter	Unit	Cell 2	Cell 3	Cell 2	Cell 3	Cell 2	Cell 3

SSB ARFCN		Freq1	freq2	freq1	Freq2	freq1	Freq2
Duplex mode		TDD TDD TD					
TDD configuration		TDDC	onf.3.1	TDDC	onf.3.1	TDDC	onf.3.1
BW <sub>channel</sub>	MHz	100: N <sub>F</sub>	<sub>RB,c</sub> = 66	100: N <sub>F</sub>	<sub>RB,c</sub> = 66	100: N <sub>F</sub>	<sub>RB,c</sub> = 66
Downlink initial BWP configuration				DLBV	/P.0.1		
Downlink dedicated BWP configuration				DLBV	/P.1.1		
Uplink initial BWP configuration				ULBV	/P.0.1		
Uplink dedicated BWP configuration				ULBV	/P.1.1		
DRX cycle configuration	ms				olicable		
TRS configuration				TRS.2	.1 TDD		
TCI state				TCI.S	tate.0		
AoA setup			Se	etup 3 defir	ned in A.3.	15	
PDSCH Reference measurement channel		SR.3.1 TDD	_	SR.3.1 TDD	-	SR.3.1 TDD	-
RMSI CORESET Reference Channel		CR.3.1 TDD	-	CR.3.1 TDD	-	CR.3.1 TDD	-
OCNG Patterns		OP.1	OP.1	OP.1	OP.1	OP.1	OP.1
SMTC configuration		SMTC. SMTC. SMTC. SMTC. SMTC.			SMTC. 1 FR2		
PDSCH/PDCCH subcarrier spacing	kHz	120	120	120	120	120	120
EPRE ratio of PSS to SSS							
EPRE ratio of PBCH DMRS to SSS							
EPRE ratio of PBCH to PBCH DMRS							
EPRE ratio of PDCCH_DMRS to SSS							
EPRE ratio of PDCCH to PDCCH_DMRS	dB	0	0	0	0	0	0
EPRE ratio of PDSCH_DMRS to SSS							
EPRE ratio of PDSCH to PDSCH_DMRS							
EPRE ratio of OCNG DMRS to SSSNote 1							
$\hat{E}_s/N_{oc}$	dB	-0.5	-0.5	11.0	11.0	-3.0	-3.0
Note 1: OCNG shall be used such that bot				_	_		
density is achieved for all OFDM s	ymbols.	: f:					

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

Note 3: SS-SINR, SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-SINR and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Table A.5.7.2.2.2-3: SS-SINR Inter frequency OTA related test parameters

Parameter	Unit	Tes	st 1	Tes	st 2	Tes	st 3	1
Faranietei	Offic	Cell 2	Cell 3	Cell 2	Cell 3	Cell 2	Cell 3	Ì

Angle of arrival configuration	degrees	Setup 1 according to A.3.15.1		Setup 1 according to A.3.15.1		Setup 1 according to A.3.15.1			
$N_{oc}^{$	dBm/15kHz Note4	-105 -105				-105		-10	05
$N_{oc}^{ m Note1}$	dBm/SCS Note3	-96 -96		-96					
SS-RSRPNote2	dBm/SCS Note4	-96.5	-96.5	-85	-85	-99	-99		
SS-SINR <sup>Note2</sup>	dB	-0.5	-0.5	11	11	-3.0	-3.0		
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	-0.5	-0.5	11	11	-3.0	-3.0		
Io <sup>Note2</sup>	dBm/95.04 MHz <sup>Note4</sup>	-69	9.3	-55	5.4	-65	.24		
Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.									
Note 2: SS-SINR, SS-RSRP, and lo levels have been derived from other parameters for information purposes. They									

- Note 2: SS-SINR, SS-RSRP, and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 3: SS-SINR and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
- Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone
- Note 6: NR operating band groups are as defined in Clause 3.5.2.
- Note 7: Void
- Note 8: Void
- Note 9: Void

# A.5.7.3.2.3 Test Requirements

The SS-SINR absolute measurement accuracy in test 1 shall be within the range Nominal SS-SINR+3dB to Nominal SS-SINR -4dB and the SS-SINR measurement accuracy in test 2 shall be within the range Nominal SS-SINR+3.5dB to Nominal SS-SINR -4.5dB according to the requirements in clause 10.1.15.1.1 with an additional -1dB margin

reflecting the possible impact of UE self noise in the test. Nominal SS-SINR is the value shown in table A.5.7.2.2.2-3

The SS-SINR relative measurement accuracy shall fulfil the requirements in clause 10.1.15.1.2.

# A.5.7.4 L1-RSRP measurement for beam reporting

#### A.5.7.4.1 SSB based L1-RSRP measurement

#### A.5.7.4.1.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 9.5.2 and clause 10.1.20.1 for L1-RSRP measurements based on SSB with the testing configurations for NR cells in Table A.5.7.4.1.1-1.

The AoA setup for this test is Setup 1 as defined in clause A.3.15.

Table A.5.7.4.1.1-1: Applicable NR configurations for FR2 SSB based L1-RSRP test

	Config	Description
1		LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2		LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
3		LTE FDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
4		LTE TDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note:	The UE is only re	equired to be tested in one of the supported test configurations in each supported band

# A.5.7.4.1.2 Test parameters

In this set of test cases there are two cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.5.7.4.1.2-1 and Table A.5.7.4.1.2-2 below. The absolute and relative accuracy of L1-RSRP measurements are tested by using the parameters in Table A.5.7.4.1.2-1 and Table A.5.7.4.1.2-2.

There is no measurement gap configured in the test. Before the test, UE is configured one SSB resource set with two SSB resources. UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSB resources 0 and 1.

Table A.5.7.4.1.2-1: FR2 SSB based L1-RSRP general test parameters

Parameter	Config	Unit	Test 1	Test 2
SSB GSCN	1~4		freq1	freq1
Duplex mode	1~4		TDD	TDD
TDD Configuration	1~4		TDDConf.3.1	TDDConf.3.1
BW <sub>channel</sub>	1~4	MHz	100: N <sub>RB,c</sub> = 66	100: N <sub>RB,c</sub> = 66
PDSCH Reference measurement channel	1~4		SR.3.1 TDD	SR.3.1 TDD
RMSI CORESET Reference Channel	1~4		CR.3.1 TDD	CR.3.1 TDD
Dedicated CORESET Reference Channel	1~4		CCR.3.1 TDD	CCR.3.1 TDD
SSP configuration	1,2		SSB.1 FR2	SSB.1 FR2
SSB configuration	3,4		SSB.2 FR2	SSB.2 FR2
OCNG Patterns	1~4		OP.1	OP.1
Initial BWP Configuration	1~4		DLBWP.0.1 ULBWP.0.1	DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~4		DLBWP.1.3 ULBWP.1.3	DLBWP.1.3 ULBWP.1.3
TRS Configuration	1~4		TRS.2.1 TDD	TRS.2.1 TDD
PDCCH/PDSCH TCI Configuration	1~4		TCI.State.2	TCI.State.2
SMTC configuration	1~4		SMTC.1	SMTC.1
reportConfigType	1~4		periodic	periodic
reportQuantity	1~4		ssb-Index-RSRP	ssb-Index-RSRP
Number of reported RS	1~4		2	2
L1-RSRP reporting period	1~4		slot640	slot640
Propagation condition	1~4		AWGN	AWGN
Antenna configuration			1x2	1x2
EPRE ratio of PSS to SSS				
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH				
DMRS			_	
EPRE ratio of PDSCH DMRS to SSS	1~4	dB	0	0
EPRE ratio of PDSCH to PDSCH DMRS				
EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>				
EPRE ratio of OCNG to OCNG DMRS Note 1				

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

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power

for  $N_{oc}$  to be fulfilled.

Parameter	Confin	Unit	Test 1		Test 2 NOTE 3		
Parameter	Config		SSB0	SSB1	SSB0	SSB1	
Angle of arrival configuration			Setup 1 according to		Setup 1 according to		
			A.3.	A.3.15.1		A.3.15.1	
$N_{oc}$	1~4	dBm/15 kHz	-100		n.a.		
$N_{oc}$	1,2	dBm/SS	-91		n.a.		
· oc	3,4	B SCS	-88		n.a.		
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	1~4	dB	10 -2		n.a	١.	
SS-RSRP <sup>Note1</sup>	1,2	dBm/SC	-81	-93	As in Table	e B.2.4-2	
33-K3KP****	3,4	S	-78 -90		As in Table B.2.4-2		
Io <sup>Note1</sup>	1~4	dBm/ 95.04M Hz	-51.57		SS-RSRP+28.98		
$\hat{E}_{s}/N_{cs}$	1~4	dB	10 -2 n.a		١.		

Table A.5.7.4.1.2-2: FR2 SSB based L1-RSRP OTA related test parameters

at each receiver antenna port.

#### A.5.7.4.1.3 Test Requirements

After 640ms from the beginning of the test, the L1-RSRP measurement accuracy for SSB#0 and SSB#1 of Cell 2 shall fulfil the requirements in clauses 10.1.20.1.

The reported L1-RSRP value shall include the Rx antenna gain in the range of  $[-10 \sim +20]$ dB.

# A.5.7.4.2 CSI-RS based L1-RSRP measurement on resource set with repetition off

#### A.5.7.4.2.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 9.5.3 and clause 10.1.20.2 for L1-RSRP measurements based on CSI-RS with the testing configurations for NR cells in Table A.5.7.4.2.1-1.

The AoA setup for this test is Setup 1 as defined in clause A.3.15.

Table A.5.7.4.2.1-1: Applicable NR configurations for FR2 CSI-RS based L1-RSRP test

	Config	Description
1		LTE FDD, NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode
2		LTE TDD, NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode
Note:	The UE is only re	equired to be tested in one of the supported test configurations in each supported band

#### A.5.7.4.2.2 Test parameters

In this set of test cases there are two cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.5.7.4.2.2-1 and Table A.5.7.4.2.2-2 below. The absolute and relative accuracy of L1-RSRP measurements are tested by using the parameters in Table A.5.7.4.2.2-1 and Table A.5.7.4.2.2-2.

Note 1: RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 2: RSRP minimum requirements are specified assuming independent interference and noise

Note 3: No additional noise is added by the test system in Test 2.

There is no measurement gap configured in the test. Before the test, UE is configured one CSI-RS resource set with two CSI-RS resources. UE is configured to perform RLM and BFD based on SSB 0 and 1. CSI-RS is not transmitted in the same OFDM symbols as SSB.

Table A.5.7.4.2.2-1: FR2 CSI-RS based L1-RSRP general test parameters

Parameter	Config	Unit	Test 1	Test 2
SSB GSCN	1~2		freq1	freq1
Duplex mode	1~2		TDD	TDD
TDD Configuration	1~2		TDDConf.3.1	TDDConf.3.1
BW <sub>channel</sub>	1~2	MHz	100: N <sub>RB,c</sub> = 66	100: N <sub>RB,c</sub> = 66
PDSCH Reference measurement channel	1~2		SR.3.1 TDD	SR.3.1 TDD
RMSI CORESET Reference Channel	1~2		CR.3.1 TDD	CR.3.1 TDD
Dedicated CORESET Reference Channel	1~2		CCR.3.1 TDD	CCR.3.1 TDD
SSB configuration	1~2		SSB.1 FR2	SSB.1 FR2
OCNG Patterns	1~2		OP.1	OP.1
Initial BWP Configuration	1~2		DLBWP.0.1 ULBWP.0.1	DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~2		DLBWP.1.3 ULBWP.1.3	DLBWP.1.3 ULBWP.1.3
TRS Configuration	1~2		TRS.2.1 TDD	TRS.2.1 TDD
PDCCH/PDSCH TCI Configuration	1~2		TCI.State.2	TCI.State.2
SMTC configuration	1~2		SMTC.1	SMTC.1
CSI-RS	1~2		CSI-RS.3.2 TDD	CSI-RS.3.2 TDD
reportConfigType	1~2		periodic	periodic
reportQuantity	1~2		cri-RSRP	cri-RSRP
Number of reported RS	1~2		2	2
L1-RSRP reporting period	1~2		slot640	slot640
Propagation condition	1~2		AWGN	AWGN
Antenna configuration	1~2		1x2	1x2
EPRE ratio of PSS to SSS				
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS EPRE ratio of PDCCH to PDCCH				
DMRS				
EPRE ratio of PDSCH DMRS to SSS	1~2	dB	0	0
EPRE ratio of PDSCH to PDSCH DMRS				-
EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>				
EPRE ratio of OCNG to OCNG DMRS Note 1				

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

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power

for  $N_{oc}$  to be fulfilled.

Table A.5.7.4.2.2-2: FR2 CSI-RS based L1-RSRP OTA related test parameters

			Test 1		Test 2 NOTE 3		
Parameter	er Config	g Unit	CSI-RS0	CSI-RS1	CSI-RS0	CSI- RS1	
Angle of arrival configuration			Setup 1 ac	cording to	Setup 1 according to		
			A.3.	15.1	A.3.1	5.1	
$N_{oc}$	1~2	dBm/15 kHz	-100		n.a	n.a.	
$N_{oc}$	1~2	dBm/SS B SCS	-91		n.a. n.a.		
$\hat{E}_{s}/I_{ot}$	1~2	dB	10 -2 n.a.		١.		
CSI-RS-RSRPNote1	1~2	dBm/SC S	-81	-93	As in Table B.2.4-2		
Io <sup>Note1</sup>	1~2	dBm/ 95.04M Hz	-59	.86	SS-RSRP+28.98		
$\hat{E}_s/N_{oc}$	1~2	dB	-51.57	-2	n.a.		

Note 1: RSRP and lo levels have been derived from other parameters for information purposes.

They are not settable parameters themselves.

Note 2: RSRP minimum requirements are specified assuming independent interference and noise

at each receiver antenna port.

Note 3: No additional noise is added by the test system in Test 2.

# A.5.7.4.2.3 Test Requirements

After 640ms from the beginning of the test, the L1-RSRP measurement accuracy for CSI-RS#0 and CSI-RS#1 of Cell 2 shall fulfil the requirements in clauses 10.1.20.2. The reported L1-RSRP value shall include the Rx antenna gain in the range of  $[-10 \sim +20]$ dB.

# A.5.8 Void

# A.6 NR standalone tests with all NR cells in FR1

# A.6.1 SA: RRC IDLE state mobility

# A.6.1.1 Cell re-selection to NR

# A.6.1.1.1 Cell reselection to FR1 intra-frequency NR case

# A.6.1.1.1.1 Test Purpose and Environment

This test is to verify the requirement for the intra frequency NR cell reselection requirements specified in clause 4.2.2.3.

#### A.6.1.1.1.2 Test Parameters

The test scenario comprises of 1 NR carrier and 2 cells as given in tables A.6.1.1.1.2-1, A.6.1.1.1.2-2 and A.6.1.1.1.2-3. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. Only cell 1 is already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing cell 2.

Table A.6.1.1.1.2-1: Supported test configurations

Configuration	Description				
1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode				
2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode				
3	30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode				
Note: The UE is only required to be tested in one of the supported test configurations.					

Table A.6.1.1.1.2-2: General test parameters for intra frequency NR cell re-selection test case

	Parameter	Unit	Test configuration	Value	Comment
Initial	Active cell		1, 2, 3	Cell1	
condition	Neighbour cells		1, 2, 3	Cell2	
T2 end	Active cell		1, 2, 3	Cell2	
condition	Neighbour cells		1, 2, 3	Cell1	
Final condition	Active cell		1, 2, 3	Cell1	
RF Chann	el Number		1, 2, 3	1	
Time offse	Time offset between cells		1	3 ms	Asynchronous cells
			2	3 μs	Synchronous cells
			3	3 μs	Synchronous cells
Access Barring Information		-	1, 2, 3	Not Sent	No additional delays in random access procedure.
SSB config	SSB configuration		1	SSB.1 FR1	·
			2	SSB.1 FR1	
			3	SSB.2 FR1	
SMTC con	figuration		1	SMTC	
•				pattern 2	
			2	SMTC	
				pattern 1	
			3	SMTC	
				pattern 1	

DRX cycle length	S	1, 2, 3	1.28	The value shall be used for all cells in the test.
PRACH configuration index		1, 2, 3	102	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
rangeToBestCell		1, 2, 3	Not configured	
T1	S	1, 2, 3	>7	During T1, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed, The intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T2
T2	S	1, 2, 3	40	T2 needs to be defined so that cell re- selection reaction time is taken into account.
Т3	S	1, 2, 3	15	T3 needs to be defined so that cell reselection reaction time is taken into account.

Table A.6.1.1.1.2-3: Cell specific test parameters for intra frequency NR cell re-selection test case in AWGN

Parameter	Unit	Test		Cell 1			Cell 2	
		configuration	T1	T2	Т3	T1	T2	T3
TDD configuration		1		N/A			N/A	•
		2	Т	DDConf.1.	1	Т	DDConf.1	.1
		3	Т	DDConf.2.	1	Т	DDConf.2	.1
PDSCH RMC		1	S	R.1.1 FDD			N/A	
configuration		2	S	R.1.1 TDD	1			
		3		R.2.1 TDD		1		
RMSI CORESET		1		R.1.1 FDD		C	R.1.1 FD	D
RMC configuration		2		R.1.1 TDD			R.1.1 TD	
		3		R.2.1 TDD		C	R.2.1 TD	D
Dedicated CORESET		1	C	CR.1.1 FDI	)	C	CR.1.1 FE	)D
RMC configuration		2	C	CR.1.1 TDI	)	C	CR.1.1 TE	)D
		3		CR.2.1 TDI			CR.2.1 TE	
OCNG Pattern		1, 2, 3		defined in A			efined in	
Initial DL BWP		1, 2, 3		DLBWP.0.1			LBWP.0.	
configuration		, , -					-	
Initial UL BWP		1, 2, 3	J	JLBWP.0.1		l	JLBWP.0.	1
configuration		, ,						
RLM-RS		1, 2, 3		SSB			SSB	
Qrxlevmin	dBm/SCS	1, 2		-140			-140	
		3		-137		-137		
Pcompensation	dB		0		0			
Qhysts	dB	1, 2, 3 1, 2, 3		0		0		
Qoffset <sub>s, n</sub>	dB	1, 2, 3		0		0		
Cell_selection_and_		1, 2, 3						
reselection_quality_		, , -		SS-RSRP			SS-RSRF	)
measurement								
$\hat{E}_{s}/I_{ot}$	dB	1	16	-3.11	2.79	-infinity	2.79	-3.11
s / -ot		2						
		3						
M. Notes	dBm/SCS	1			-98	3		
$N_{oc}$ Note2		2			-98			
		3			-95			
<b>N</b> 7	dBm/15 kHz	1			-98			
$N_{oc}$ Note2		2						
		3						
$\hat{E}_s/N_{oc}$	dB	1	16	13	16	-infinity	16	13
25/11/00		2						
		3						
SS-RSRP Note3	dBm/SCS	1	-82	-85	-82	-infinity	-82	-85
121		2	-82	-85	-82	-infinity	-82	-85
		3	-79	-82	-79	-infinity	-79	-82
lo	dBm/9.36 MHz	1	-53.94	-52.21	-52.21			
	dBm/9.36 MHz	2	-53.94 -52.21 -52.21 pecified in Cell 1 coll -53.94 -52.21 -52.21					
	dBm/38.16 MHz	3	-47.85	-46.12	-46.12	1		
Treselection	S S	1, 2, 3	0	0	0	0	0	0
Sintrasearch	dB	1, 2, 3	, ,	N50			N50	<u> </u>
Propagation	35	1, 2, 3		.,,,,	AWG	N	1,50	
Condition		., _, 0			,,,,,			
		l .						

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers

and time and shall be modelled as AWGN of appropriate power for  $rac{N_{oc}}{}$  to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

### A.6.1.1.3 Test Requirements

The cell reselection delay to a newly detectable cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 2.

The cell re-selection delay to a newly detectable cell shall be less than 34 s.

The cell reselection delay to an already detected cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on cell 1.

The cell re-selection delay to an already detected cell shall be less than 8 s.

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

NOTE: The cell re-selection delay to a newly detectable cell can be expressed as:  $T_{\text{detect, NR\_Intra}} + T_{\text{SI-NR}}$ , and to an already detected cell can be expressed as:  $T_{\text{evaluate, NR\_intra}} + T_{\text{SI-NR}}$ ,

#### Where:

 $T_{detect, NR\_Intra}$  See Table 4.2.2.3-1 in clause 4.2.2.3  $T_{evaluate, NR\_intra}$  See Table 4.2.2.3-1 in clause 4.2.2.3

T<sub>SI-NR</sub> Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280ms is assumed in this test case.

This gives a total of 33.28 s, allow 34 s for the cell re-selection delay to a newly detectable cell and 7.68 s for the cell re-selection delay to an already detected cell in the test case, which we allow 8 s.

### A.6.1.1.2 Cell reselection to FR1 inter-frequency NR case

### A.6.1.1.2.1 Test Purpose and Environment

This test is to verify the requirement for the inter frequency NR cell reselection requirements specified in clause 4.2.2.4.

### A.6.1.1.2.2 Test Parameters

The test scenario comprises of 2 cells on 2 different NR carriers respectively as given in tables A.6.1.1.2.2-1, A.6.1.1.2.2-2 and A.6.1.1.2.2-3. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas and cell 2 is of higher priority than cell 1.

Table A.6.1.1.2.2-1: Supported test configurations

Configuration	Description of serving cell	Description of target cell		
1	15 kHz SSB SCS, 10 MHz bandwidth, FDD	15 kHz SSB SCS, 10 MHz bandwidth, FDD		
	duplex mode	duplex mode		
2	15 kHz SSB SCS, 10 MHz bandwidth, TDD	15 kHz SSB SCS, 10 MHz bandwidth, TDD		
	duplex mode	duplex mode		
3	30 kHz SSB SCS, 40 MHz bandwidth, TDD	30 kHz SSB SCS, 40 MHz bandwidth, TDD		
	duplex mode	duplex mode		
Note: The UE is only required to be tested in one of the supported test configurations.				

Table A.6.1.1.2.2-2: General test parameters for FR1 inter frequency NR cell re-selection test case

	Parameter	Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3	Cell2	The UE camps on cell 2 in the initial phase and during T1 period the UE reselects to cell 1
T1 end	Active cell		1, 2, 3	Cell1	The UE shall perform reselection to cell 1
condition	Neighbour cells		1, 2, 3	Cell2	during T1
T3 end condition	Active cell		1, 2, 3	Cell2	The UE shall perform reselection to cell 2 with higher priority during T3
RF Channe			1, 2, 3	1, 2	
Time offse	t between cells		1	3 ms	Asynchronous cells
			2	3 μs	Synchronous cells
			3	3 μs	Synchronous cells
	rring Information	-	1, 2, 3	Not Sent	No additional delays in random access procedure.
SSB config	guration		1	SSB.1 FR1	
			2	SSB.1 FR1	
			3	SSB.2 FR1	
SMTC con	figuration		1	SMTC	
				pattern 2	
			2	SMTC	
			3	pattern 1 SMTC	
			3	pattern 1	
DRX cycle	length	S	1, 2, 3	1.28	The value shall be used for all cells in the test.
	onfiguration index		1, 2, 3	102	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
rangeToBe	estCell		1, 2, 3	Not	
				configured	
T1		s	1, 2, 3	15	T1 needs to be defined so that cell reselection reaction time is taken into account.
T2		S	1, 2, 3	>7	During T2, cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that cell 2 has not been detected by the UE prior to the start of period T3.
Т3		s	1, 2, 3	75	T3 needs to be defined so that cell re- selection reaction time is taken into account.

Table A.6.1.1.2.2-3: Cell specific test parameters for FR1 inter frequency NR cell re-selection test case in AWGN

Parameter	Unit	Test	Cell 1			Cell 2			
		configuration	T1	T2	T3	T1	T2	Т3	
TDD configuration		1	N/A		N/A				
		2 TDDConf.1.1 TDDC		TDDConf.1.1 TDDC		DDConf.1.	1		
		3	TDDConf.2.1		TDDConf.2.1				
PDSCH RMC		1	SR.1.1 FDD		D N/A				
configuration		2	S	R.1.1 TDD	)				
		3	SR.2.1 TDD		SR.2.1 TDD				
RMSI CORESET		1	C	R.1.1 FDD	)	C	R.1.1 FDD	)	
RMC configuration		2	CR.1.1 TDD CR.1.1 TD		R.1.1 TDD	)			
		3	C	R.2.1 TDD	)	C	R.2.1 TDD		

Dedicated CORESET		1	CCR.1.1 FDD CCR.1.1 FDD				D	
RMC configuration		2	CCR.1.1 TDD CCR.1.1 TDD					
		3	CCR.2.1 TDD CCR.2.1 TDI					
OCNG Pattern		1, 2, 3	OP.1 defined in A.3.2.1 OP.1 defined in A.3.					
Initial DL BWP		1, 2, 3		DLBWP.0.1			DLBWP.0.	
configuration		-, _, -				_		
Initial UL BWP		1, 2, 3	į į	JLBWP.0.1		Į	JLBWP.0.	1
configuration		, , -						
RLM-RS		1, 2, 3		SSB			SSB	
Qrxlevmin	dBm/SCS	1, 2		-140			-140	
		3		-137			-137	
Pcompensation	dB	1, 2, 3		0			0	
Qhysts	dB	1, 2, 3		0			0	
Qoffset <sub>s, n</sub>	dB			0			0	
Cell_selection_and_		1, 2, 3 1, 2, 3						
reselection quality				SS-RSRP			SS-RSRP	
measurement			CO NON					
$\hat{E}_s/I_{ot}$	dB	1	14	14	14	-4	-infinity	12
s / Tot		2						
		3						
M. W. O	dBm/SCS	1	-98					
$N_{oc}$ Note2		2	-98					
		3	-95					
M. Nete 0	dBm/15 kHz	1			-98			
$N_{oc}$ Note2		2						
		3						
$\hat{E}_s/N_{oc}$	dB	1	14	14	14	-4	-infinity	12
25/1.00		2						
		3						
SS-RSRP Note3	dBm/SCS	1	-84	-84	-84	-102	-infinity	-86
		2	-84	-84	-84	-102	-infinity	-86
		3	-81	-81	-81	-99	-infinity	-83
lo	dBm/9.36 MHz	1	-55.88	-55.88	-55.88	-68.60	-infinity	-57.78
	dBm/9.36 MHz	2	-55.88	-55.88	-55.88	-68.60	-infinity	-57.78
	dBm/38.16 MHz	3	-49.79	-49.79	-49.79	-62.50	-infinity	-51.69
Treselection	S	1, 2, 3	0	0	0	0	0	0
Snonintrasearch	dB	1, 2, 3		50			Not sent	
Thresh <sub>x, high</sub>	dB	1, 2, 3		48			48	
Thresh <sub>serving</sub> , low	dB	1, 2, 3		44			44	
Thresh <sub>x, low</sub>	dB	1, 2, 3		50			50	
Propagation		1, 2, 3			AWG	N		
Condition		•						

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers

and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 3:

### A.6.1.1.2.3 Test Requirements

The cell reselection delay to a higher priority cell is defined as the time from the beginning of time period T3, to the moment when the UE camps again on cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to a higher priority cell shall be less than 68 s.

The cell reselection delay to a lower priority cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on cell 1.

The cell re-selection delay to a lower priority cell shall be less than 8 s.

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

NOTE: The cell re-selection delay to a higher priority cell can be expressed as:  $T_{higher\_priority\_search} + T_{evaluate, NR\_inter} + T_{SI-NR}$ , and to a lower priority cell can be expressed as:  $T_{evaluate, NR\_inter} + T_{SI-NR}$ ,

#### Where:

Thigher priority search See clause 4.2.2.7

T<sub>evaluate, NR inter</sub> See Table 4.2.2.4-1 in clause 4.2.2.4

T<sub>SI-NR</sub> Maximum repetition period of relevant system info blocks that needs to be received by the UE

to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 67.68 s, allow 68 s for the cell re-selection delay to a higher priority cell and 7.68 s for the cell re-selection delay to a lower priority cell in the test case, which we allow 8 s.

### A.6.1.2 Inter-RAT E-UTRAN cell re-selection

### A.6.1.2.1 Cell reselection to higher priority E-UTRAN

### A.6.1.2.1.1 Test Purpose and Environment

This test is to verify the requirement for the NR to E-UTRAN inter-RAT cell reselection requirements specified in clause 4.2.2.5 when the E-UTRAN cell is of higher priority.

#### A.6.1.2.1.2 Test Parameters

The test scenario comprises of one NR cell and one E-UTRAN cell as given in tables A.6.1.2.1.2-1, A.6.1.2.1.2-2, A.6.1.2.1.2-3 and A.6.1.2.1.2-4. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. NR cell 1 is already identified by the UE prior to the start of the test. E-UTRAN cell 2 is of higher priority than cell 1.

Table A.6.1.2.1.2-1: Supported test configurations

Configuration	Description of serving cell	Description of target cell
1	NR 15 kHz SSB SCS, 10 MHz bandwidth,	LTE 10 MHz bandwidth, TDD duplex mode
	FDD duplex mode	
2	NR 15 kHz SSB SCS, 10 MHz bandwidth,	LTE 10 MHz bandwidth, TDD duplex mode
	TDD duplex mode	
3	NR 30 kHz SSB SCS, 40 MHz bandwidth,	LTE 10 MHz bandwidth, TDD duplex mode
	TDD duplex mode	
4	NR 15 kHz SSB SCS, 10 MHz bandwidth,	LTE 10 MHz bandwidth, FDD duplex mode
	FDD duplex mode	
5	NR 15 kHz SSB SCS, 10 MHz bandwidth,	LTE 10 MHz bandwidth, FDD duplex mode
	TDD duplex mode	
6	NR 30 kHz SSB SCS, 40 MHz bandwidth,	LTE 10 MHz bandwidth, FDD duplex mode
	TDD duplex mode	
Note: The U	IE is only required to be tested in one of the supp	ported test configurations.

Table A.6.1.2.1.2-2: General test parameters for NR to E-UTRAN cell re-selection test case

	Parameter	Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3, 4, 5, 6	Cell1	The UE camps on cell 1 in the initial phase and during T2 period the UE reselects to cell 2.
T2 end	Active cell		1, 2, 3, 4, 5, 6	Cell2	The UE shall perform reselection to cell 2
condition	Neighbour cells		1, 2, 3, 4, 5, 6	Cell1	during T2.
T3 end	Active cell		1, 2, 3, 4, 5, 6	Cell1	The UE shall perform reselection to cell 1
condition	Neighbour cells		1, 2, 3, 4, 5, 6	Cell2	during T3 for iteration of the tests.
Access Ba	rring Information	-	1, 2, 3, 4, 5, 6	Not Sent	No additional delays in random access procedure.
DRX cycle	length	S	1, 2, 3, 4, 5, 6	1.28	The value shall be used for all cells in the test.
NR PRACE	H configuration index		1, 2, 3, 4, 5, 6	87	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
E-UTRAN index	PRACH configuration		1, 2, 3, 4, 5, 6	4	As specified in table 5.7.1-2 in TS 36.211 [23]
T1		S	1, 2, 3, 4, 5, 6	>7	During T1, cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that cell 2 has not been detected by the UE prior to the start of period T2.
T2		S	1, 2, 3, 4, 5, 6	75	T2 needs to be defined so that cell reselection reaction time is taken into account.
Т3		S	1, 2, 3, 4, 5, 6	15	T3 needs to be defined so that cell reselection reaction time is taken into account.

Table A.6.1.2.1.2-3: Cell specific test parameters for NR cell 1

Parameter	Unit	Test configuration		Cell 1		
		_	T1	T2	T3	
TDD configuration		1, 4		N/A		
		2, 5	Т	TDDConf.1.1		
		3, 6	Т	DDConf.2	2.1	
PDSCH parameters		1, 4	5	SR.1.1 FD	D	
		2, 5	5	SR.1.1 TD	D	
		3, 6	5	SR.2.1 TD	D	
RMSI CORESET		1, 4	CR.1.1 FDD			
parameters		2, 5	(	CR.1.1 TD	D	
		3, 6	(	CR.2.1 TD	D	
Dedicated CORESET		1, 4	С	CR.1.1 FE	DD	
parameters		2, 5	С	CR.1.1 TE	DD	
		3, 6	С	CR.2.1 TE	DD	
SSB parameters		1, 4	SSB.1 FR1			
		2, 5	;	SSB.1 FR	1	
			,	SSB.2 FR	1	
NR SMTC parameters		1, 4	SMTC pattern 2		rn 2	
		2, 5	SN	/ITC patter	rn 1	
		3, 6	SN	/ITC patter	rn 1	

OCNG Pattern		1, 2, 3, 4, 5, 6	OP.1 d	efined in	A.3.2.1
Initial DL BWP configuration		1, 2, 3, 4, 5, 6		DLBWP.0	)
Initial UL BWP configuration		1, 2, 3, 4, 5, 6		ULBWP.0	
RLM-RS		1, 2, 3, 4, 5, 6		SSB	
Qrxlevmin	dBm/SCS	1, 2, 4, 5		-140	
		1, 2, 4, 5 3, 6		-137	
$\mathcal{M}$	dBm/SCS	1, 4		-98	
$N_{oc}$		2, 5		-98	
		3, 6		-95	
$N_{oc}$	dBm/15 kHz	1, 2, 3, 4, 5, 6		-98	
1 oc					
SS-RSRP	dBm/SCS	1, 4	-84	-84	-84
		2, 5	-84	-84	-84
		3, 6	-81	-81	-81
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	1, 4	14	14	14
s / ot		2, 5			
		3, 6			
$\hat{E_s}/N_{oc}$	dB	1, 4	14	14	14
si de		2, 5			
		3, 6			
lo	dBm/9.36 MHz	1, 4	-55.88	-55.88	-55.88
	dBm/9.36 MHz	2, 5	-55.88	-55.88	-55.88
	dBm/38.16 MHz	3, 6	-49.79	-49.79	-49.79
Treselection	S	1, 2, 3, 4, 5, 6		0	
Snonintrasearch	dB	1, 2, 3, 4, 5, 6		50	
Thresh <sub>x, high (Note 2)</sub>	dB	1, 2, 3, 4, 5, 6		48	
Thresh <sub>serving, low</sub>	dB	1, 2, 3, 4, 5, 6		44	
Thresh <sub>x, low</sub>	dB	1, 2, 3, 4, 5, 6		50	
Propagation Condition		1, 2, 3, 4, 5, 6		AWGN	:44I

Note 2: This refers to the value of Thresh<sub>x, high</sub> which is included in NR system information, and is a threshold for the E-UTRA target cell

Table A.6.1.2.1.2-4: Cell specific test parameters for E-UTRA cell 2

Parameter	Unit	Cell 2		
		T1	T2	T3
E-UTRA RF Channel			1	
number				
BW <sub>channel</sub>	MHz		10	
OCNG Patterns defined in		OP.	2 TDD for	test
TS 36.133 [15] clause A.3.2		confi	guration 1	, 2, 3;
		OP.	2 FDD for	test
		confi	guration 4	, 5, 6
PBCH_RA	dB			
PBCH_RB	dB			
PSS_RA	dB			
SSS_RA	dB			
PCFICH_RB	dB			
PHICH_RA	dB			
PHICH_RB	dB		0	
PDCCH_RA	dB			
PDCCH_RB	dB			
PDSCH_RA	dB			
PDSCH_RB	dB			
OCNG_RA <sup>Note 1</sup>	dB			
OCNG_RB <sup>Note 1</sup>	dB			

Qrxlevmin	dBm		-140	
$N_{aa}$	dBm/15 kHz		-98	
- ' oc				1
RSRP	dBm/15 KHz	-infinity	-86	-102
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	-infinity	12	-4
$\hat{E_s}/N_{oc}$	dB	-infinity	12	-4
Treselection <sub>EUTRAN</sub>	S		0	
Snonintrasearch	dB		Not sent	
Thresh <sub>x, high (Note 2)</sub>	dB		48	
Thresh <sub>serving, low</sub>	dB		44	
Thresh <sub>x, low</sub>	dB		50	•
Propagation Condition			AWGN	

Note 2: This refers to the value of Thresh<sub>x, high</sub> which is included in E-UTRA system information, and is a threshold for the NR target cell

### A.6.1.2.1.3 Test Requirements

The cell reselection delay to a higher priority E-UTRAN cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to a higher priority cell shall be less than 68 s.

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

NOTE: The cell re-selection delay to a higher priority cell can be expressed as:  $T_{higher\_priority\_search} + T_{evaluate, E-UTRAN} + T_{SI-E-UTRA}$ ,

#### Where:

 $T_{higher\_priority\_search}$  See clause 4.2.2.7

T<sub>evaluate, E-UTRAN</sub> See Table 4.2.2.5-1 in clause 4.2.2.5

T<sub>SI-E-UTRA</sub> Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 67.68 s, allow 68 s for the cell re-selection delay to a higher priority E-UTRAN cell.

### A.6.1.2.2 Cell reselection to lower priority E-UTRAN

#### A.6.1.2.2.1 Test Purpose and Environment

This test is to verify the requirement for the NR to E-UTRAN inter-RAT cell reselection requirements specified in clause 4.2.2.5 when the E-UTRAN cell is of lower priority.

#### A.6.1.2.2.2 Test Parameters

The test scenario comprises of one NR cell and one E-UTRAN cell as given in tables A.6.1.2.2.2-1, A.6.1.2.2.2-2, A.6.1.2.2.2-3 and A.6.1.2.2.2-4. The test consists of three successive time periods, with time duration of T1 and T2 respectively. Both NR cell 1 and E-UTRAN cell 2 are already identified by the UE prior to the start of the test. E-UTRAN cell 2 is of lower priority than cell 1.

Table A.6.1.2.2.2-1: Supported test configurations

Configuration	Description of serving cell	Description of target cell				
1	NR 15 kHz SSB SCS, 10 MHz bandwidth,	LTE 10 MHz bandwidth, TDD duplex mode				
	FDD duplex mode					
2	NR 15 kHz SSB SCS, 10 MHz bandwidth,	LTE 10 MHz bandwidth, TDD duplex mode				
	TDD duplex mode					
3	NR 30 kHz SSB SCS, 40 MHz bandwidth,	LTE 10 MHz bandwidth, TDD duplex mode				
	TDD duplex mode					
4	NR 15 kHz SSB SCS, 10 MHz bandwidth,	LTE 10 MHz bandwidth, FDD duplex mode				
	FDD duplex mode					
5	NR 15 kHz SSB SCS, 10 MHz bandwidth,	LTE 10 MHz bandwidth, FDD duplex mode				
	TDD duplex mode					
6	NR 30 kHz SSB SCS, 40 MHz bandwidth,	LTE 10 MHz bandwidth, FDD duplex mode				
	TDD duplex mode					
Note: The U	Note: The UE is only required to be tested in one of the supported test configurations.					

Table A.6.1.2.2.2-2: General test parameters for NR to E-UTRAN cell re-selection test case

	Parameter		Parameter		Test	Value	Comment
			configuration				
Initial			1, 2, 3, 4, 5, 6	Cell2	The UE camps on cell 1 in the initial		
condition					phase.		
T1 end	Active cell		1, 2, 3, 4, 5, 6	Cell2	The UE shall perform reselection to cell 2		
condition	Neighbour cells		1, 2, 3, 4, 5, 6	Cell1	during T1.		
T2 end	Active cell		1, 2, 3, 4, 5, 6	Cell1	The UE shall perform reselection to cell 1		
condition	Neighbour cells		1, 2, 3, 4, 5, 6	Cell2	during T2 for iteration of the tests.		
Access Ba	rring Information	-	1, 2, 3, 4, 5, 6	Not Sent	No additional delays in random access		
					procedure.		
DRX cycle	DRX cycle length		1, 2, 3, 4, 5, 6	1.28	The value shall be used for all cells in the		
					test.		
NR PRACI	I configuration index		1, 2, 3, 4, 5, 6	87	The detailed configuration is specified in		
					TS 38.211 clause 6.3.3.2		
E-UTRAN	PRACH configuration		1, 2, 3, 4, 5, 6	4	As specified in table 5.7.1-2 in		
index					TS 36.211 [23]		
T1		S	1, 2, 3, 4, 5, 6	15	T1 needs to be defined so that cell re-		
					selection reaction time is taken into		
					account.		
T2		S	1, 2, 3, 4, 5, 6	75	T2 needs to be defined so that cell re-		
					selection reaction time is taken into		
					account.		

Table A.6.1.2.2.2-3: Cell specific test parameters for NR cell 1

Parameter	Unit	Test configuration	Cell 1		
		•	T1	T2	
TDD configuration		1, 4	N/A		
		2, 5	TDDCo	nf.1.1	
		3, 6	TDDCo	nf.2.1	
PDSCH RMC configuration		1, 4	SR.1.1	FDD	
		2, 5	SR.1.1	TDD	
		3, 6	SR.2.1	TDD	
RMSI CORESET RMC		1, 4	CR.1.1	FDD	
configuration		2, 5	CR.1.1	TDD	
		3, 6	CR.2.1	TDD	
Dedicated CORESET RMC		1, 4	CCR.1.	1 FDD	
configuration		2, 5	CCR.1.	1 TDD	
		3, 6	CCR.2.	1 TDD	
SSB configuration		1, 4	SSB.1	FR1	
		2, 5	SSB.1		
		3, 6	SSB.2		
SMTC configuration		1, 4	SMTC pa		
		2, 5	SMTC pa		
		3, 6	SMTC pa		
OCNG Pattern		1, 2, 3, 4, 5, 6	OP.1 defined		
Initial DL BWP configuration		1, 2, 3, 4, 5, 6	DLBV		
Initial UL BWP configuration		1, 2, 3, 4, 5, 6	ULBV		
RLM-RS		1, 2, 3, 4, 5, 6	SS		
Qrxlevmin	dBm/SCS	1, 2, 4, 5	-140		
GINIOVIIIII	<b>4</b> B111/000	3, 6	-13		
3.7	dBm/SCS	1, 4	-98		
$N_{oc}$	dBill/000	2, 5	-98		
		3, 6	-9:		
37	dBm/15 kHz	1, 2, 3, 4, 5, 6	-98		
$N_{oc}$	dBiii/ 10 Ki iz	1, 2, 0, 4, 0, 0	-50	,	
SS-RSRP	dBm/SCS	1, 4	-102	-86	
		2, 5	-102	-86	
		3, 6	-99	-83	
$\hat{E}_{s}/I_{ot}$	dB	1, 4	-4	12	
L <sub>s</sub> / ot		2, 5			
		3, 6			
$\hat{E}_s/N_{oc}$	dB	1, 4	-4	12	
$E_s/W_{oc}$		2, 5	•		
		3, 6			
lo	dBm/9.36 MHz	1, 4	-68.60	-57.78	
	dBm/9.36 MHz	2, 5	-68.60	-57.78	
	dBm/38.16 MHz	3, 6	-62.50	-51.69	
Treselection	S	1, 2, 3, 4, 5, 6	0		
Snonintrasearch	dB	1, 2, 3, 4, 5, 6	50	)	
Thresh <sub>x, high</sub> (Note 2)	dB	1, 2, 3, 4, 5, 6	48		
Thresh <sub>serving, low</sub>	dB	1, 2, 3, 4, 5, 6	44		
Thresh <sub>x, low</sub>	dB	1, 2, 3, 4, 5, 6	50		
Propagation Condition	ų d	1, 2, 3, 4, 5, 6	AWO		
Note 1: OCNG shall be use					

Note 2: This refers to the value of Thresh<sub>x, high</sub> which is included in NR system information, and is a threshold for the E-UTRA target cell

Table A.6.1.2.2.2-4: Cell specific test parameters for E-UTRA cell 2

Parameter	Unit	Ce	ell 2			
		T1	T2			
E LITDA DE Obassia			T3			
E-UTRA RF Channel number			1			
BW <sub>channel</sub>	MHz		10			
OCNG Patterns defined in	IVII IZ		DD for test			
TS 36.133 [15] clause A.3.2			tion 1, 2, 3;			
10 00.100 [10] 014430 74.0.2			D for test			
			tion 4, 5, 6			
PBCH RA	dB	J	• •			
PBCH RB	dB					
PSS_RA	dB					
SSS_RA	dB					
PCFICH_RB	dB					
PHICH_RA	dB		•			
PHICH_RB	dB	0				
PDCCH_RA	dB					
PDCCH_RB	dB					
PDSCH_RA	dB					
PDSCH_RB	dB					
OCNG_RA <sup>Note 1</sup>	dB					
OCNG_RBNote 1	dB					
Qrxlevmin	dBm		40			
$N_{oc}$	dBm/15 kHz	_'	98			
RSRP	dBm/15 KHz	-84	-84			
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	14	14			
$\hat{E_s}/N_{oc}$	dB	14	14			
TreselectionEUTRAN	S		0			
Snonintrasearch	dB	Not	sent			
Thresh <sub>x, high (Note 2)</sub>	dB		18			
Thresh <sub>serving, low</sub>	dB	44				
Thresh <sub>x, low</sub>	dB	50				
	Propagation Condition AWGN					
Note 1: OCNG shall be use						
and a constant total transmitted power spectral density is achieved for all OFDM symbols.						
Note 2: This refers to the value of Thresh <sub>x, high</sub> which is included in E-						

Note 2: This refers to the value of Thresh<sub>x, high</sub> which is included in E-UTRA system information, and is a threshold for the NR target

### A.6.1.2.2.3 Test Requirements

The cell reselection delay to a lower priority E-UTRAN cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to a lower priority cell shall be less than 8 s.

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

NOTE: The cell re-selection delay to a lower priority cell can be expressed as: Tevaluate, E-UTRAN + TSI-E-UTRA,

Where:

T<sub>evaluate, E-UTRAN</sub> See Table 4.2.2.5-1 in clause 4.2.2.5

T<sub>SI-E-UTRA</sub> Maximum repetition period of relevant system info blocks that needs to be received by the UE

to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 7.68 s, allow 8 s for the cell re-selection delay to a lower priority E-UTRAN cell.

# A.6.2 SA: RRC INACTIVE state mobility

# A.6.3 RRC\_CONNECTED state mobility

### A.6.3.1 Handover

## A.6.3.1.1 Intra-frequency handover from FR1 to FR1; known target cell

### A.6.3.1.1.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR1-NR FR1 intra frequency handover requirements specified in clause 6.1.1.2.

### A.6.3.1.1.2 Test Parameters

Supported test configurations are shown in table A.6.3.1.1.2-1. Both handover delay and interruption length are tested by using the parameters in table A.6.3.1.1.2-2, and A.6.3.1.1.2-3.

The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE may not have any timing information of cell 2.

NR shall send a RRC message implying handover to cell 2. The RRC message implying handover shall be sent to the UE during period T2, after the UE has reported Event A3. T3 is defined as the end of the last TTI containing the RRC message implying handover.

Table A.6.3.1.1.2-1: Intra-frequency handover from FR1 to FR1 test configurations

Config	Description
1	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
	Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
	Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3	Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
	Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is o	nly required to be tested in one of the supported test configurations

Table A.6.3.1.1.2-2: General test parameters Intra-frequency handover from FR1 to FR1

Pa	rameter	Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
A3-Offset		dB	0	
Hysteresis		dB	0	
Time To Trigger		S	0	
Filter coefficient			0	L3 filtering is not used
Access Barring In	formation	-	Not Sent	No additional delays in random
				access procedure.
PRACH configura	tion index		FR1 PRACH configuration 1	As specified in table Table 6.3.3.2-
			-	3 in TS 38.211 [6]
Time offset betwe	en cells		3 μs	Synchronous cells

T1	S	5	
T2	S	≤5	
T3	S	1	

Table A.6.3.1.1.2-3: Cell specific test parameters for NR FR1-FR1 Intra frequency handover test case

Parame	eter	Unit	T1	Cell 1	Т3	T1	Cell 2 T2	Т3
NR RF Channel Number			- ' '	1	10		1	10
	Config 1				FD	)D	<u> </u>	
Duplex mode	Config 2,3				TD			
	Config 1				Not App			
TDD configuration	Config 2				TDDCc			
	Config 3				TDDCc			
	Config 1				10: N <sub>RE</sub>			
BW <sub>channel</sub>	Config 2	MHz			10: N <sub>RE</sub>			
	Config 3				40: N <sub>RB</sub> ,			
	Config 1				10: N <sub>RE</sub>	<sub>3,c</sub> = 52		
BWP BW	Config 2	MHz			10: N <sub>RE</sub>			
	Config 3				40: N <sub>RB</sub> ,			
DRx Cycle		ms			Not App			
DDCCII Deference	Config 1				SR.1.1			
PDSCH Reference	Config 2				SR.1.1	TDD		
measurement channel	Config 3				SR2.1	TDD		
CODECET Defenses	Config 1				CR.1.1	FDD		
CORESET Reference Channel	Config 2				CR.1.1	I TDD		
Channel	Config 3				CR2.1	TDD		
	Config 1				TRS.1.			
TRS configuration	Config 2		TRS.1.1 TDD					
	Config 3		TRS.1.2 TDD					
OCNG Patterns			OCNG pattern 1					
SMTC Configuration			SMTC pattern 1					
SSB Configuration	Config 1,2		SSB.1 FR1					
	Config 3				SSB.2			
PDSCH/PDCCH	Config 1,2	kHz	15 kHz					
subcarrier spacing	Config 3	NI IZ			30 k			
PUCCH/PUSCH	Config 1,2	kHz			15 k			
subcarrier spacing	Config 3	IXI IZ			30 k			
PRACH configuration				FR1		onfiguration	on 1	
BWP configuraiton	Initial DL BWP				DLBW			
	Dedicated DL				DLBW	P.1.1		
	BWP					- ·		
	Initial UL BWP				ULBW			
	Dedicated UL				ULBW	P.1.1		
EDDE rotio of DOC to OC	BWP							
EPRE ratio of PSS to SS								
EPRE ratio of PBCH by								
EPRE ratio of PBCH to F								
EPRE ratio of PDCCH to								
EPRE ratio of PDCCH to		dB	0					
EPRE ratio of PDSCH DMRS to SSS EPRE ratio of PDSCH to PDSCH								
EPRE ratio of OCNG DM								
EPRE ratio of OCNG bit								
1)	OCIAO DIVIKO (IAOLE							
		dBm/15kH						
$N_{oc}^{ m Note2}$		Z Z			-9	8		
Config 1,2					-9	8		

$N_{oc}^{ m Note2}$	Config 3	dBm/SCS	-95					
${ m \hat{E}}_{_{ m s}}/{ m I}_{_{ m ot}}$		dB	8	-3.3	-3.3	- Infinity	2.36	2.36
$\hat{E}_s/N_{oc}$		dB	8	8	8	8 - 11		11
CCD DD	Config 1,2	dBm/SCS	-90	-90	-90	- Infinity	-87	-87
SSB_RP	Config 3	dBm/SCS	-87	8 -3.3 -3.3   -3	-84	-84		
IoNote3	Config 1,2	dBm/ 9.36MHz	-61.41	-57.06	-57.06	-61.41	-57.06	-57.06
10	Config 3	dBm/SCS -87 -87 -87 -87 -84 -57.06 -57.06 -61.41 -57.06 dBm/ 38.16MHz -55.31 -50.96 -50.96 -55.31 -50.	-50.96	-50.96				
Propagation	on condition	-		AWGN			AWGN	

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

### A.6.3.1.1.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 220 ms from the beginning of time period T3. The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay + T<sub>interrupt</sub>, where:

RRC procedure delay = 10 ms and is specified in clause 12 in TS 38.331 [2].

 $T_{interrupt} = 210 \text{ ms in the test. } T_{interrupt} \text{ is defined in clause } 6.1.1.2.2.$ 

This gives a total of 220 ms.

### A.6.3.1.2 Intra-frequency handover from FR1 to FR1; unknown target cell

#### A.6.3.1.2.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR1-NR FR1 intra frequency handover requirements specified in clause 6.1.1.2.

### A.6.3.1.2.2 Test Parameters

Supported test configurations are shown in table A.6.3.1.2.2-1. Both handover delay and interruption length are tested by using the parameters in table A.6.3.1.2.2-2, and A.6.3.1.2.2-3.

The test scenario comprises of two carriers and one cell on each carrier. No gap patterns are configured in the test case. The test consists of two successive time periods, with time durations of T1, T2 respectively. At the start of time duration T1, the UE does not have any timing information of cell 2. Starting T2, cell 2 becomes detectable and the UE receives a RRC handover command from the network. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

Table A.6.3.1.2.2-1: Intra-frequency handover from FR1 to FR1 test configurations

Config	Description				
1	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode				
	Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode				
2	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode				
	Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode				
3	Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode				
	Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode				
Note: The UE is only required to be tested in one of the supported test configurations					

Table A.6.3.1.2.2-2: General test parameters Intra-frequency handover from FR1 to FR1

Pai	rameter	Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
A3-Offset		dB	0	
Hysteresis		dB	0	
Time To Trigger	Γime To Trigger		0	
Filter coefficient			0	L3 filtering is not used
Access Barring Inf	formation	-	Not Sent	No additional delays in random
				access procedure.
PRACH configura	tion index		FR1 PRACH configuration 1	As specified in table Table 6.3.3.2-
				3 in TS 38.211 [6]
Time offset between	en cells		3 μs	Synchronous cells
T1		S	5	
T2		S	≤5	

Table A.6.3.1.2.2-3: Cell specific test parameters for NR FR1-FR1 Intra frequency handover test case

Волом	-to	Unit	Cell 1 T1 T2 T1		Ce	II 2	
Parameter		Unit	T1	T2	T1	T2	
NR RF Channel Number	-			1	1		
Dunley made	Config 1		FDD				
Duplex mode	Config 2,3			TE	DD		
	Config 1			Not App	olicable		
TDD configuration	Config 2			TDDC	onf.1.1		
	Config 3			TDDCc	onf. 2.1		
	Config 1		10: N <sub>RB,c</sub> = 52 10: N <sub>RB,c</sub> = 52				
BW <sub>channel</sub>	Config 2	MHz		10: N <sub>R</sub>	<sub>B,c</sub> = 52		
	Config 3			40: N <sub>RB</sub>	,c = 106		
	Config 1		10: N <sub>RB,c</sub> = 52				
BWP BW	Config 2	MHz	10: N <sub>RB,c</sub> = 52				
	Config 3				,c = 106		
DRx Cycle		ms		Not App	plicable		
PDSCH Reference	Config 1			SR.1.	1 FDD		
measurement channel	Config 2				1 TDD		
Theadarement charmer	Config 3			SR2.1	I TDD		
CORESET Reference	Config 1		SR2.1 TDD CR.1.1 FDD				
Channel	Config 2			CR.1.			
Onamici	Config 3			CR2.1	1 TDD		
	Config 1			TRS.1.			
TRS configuration	Config 2			TRS.1.	.1 TDD		
	Config 3			TRS.1.			
OCNG Patterns				OCNG p			
SMTC Configuration				SMTC p	attern 1		

SSR Configuration Config 1,2				SSB.	1 FR1			
SSB Config	guration	Config 3		SSB.2 FR1				
PDSCH/PI	DCCH	Config 1,2	1:11=		15 I	kHz		
subcarrier	spacing	Config 3	kHz		30 I	kHz		
PUCCH/PU	JSCH	Config 1,2	kHz	15 kHz				
subcarrier		Config 3	KIIZ			kHz		
PRACH co	nfiguration				FR1 PRACH of			
		Initial DL BWP			DLBW			
DWD confi	guration	Dedicated DL BWP			DLBW	/P.1.1		
BWP confi	guration	Initial UL BWP			ULBW	/P.0.1		
		Dedicated UL BWP			ULBW	/P.1.1		
EPRE ratio	of PSS to SS	SS						
EPRE ratio	of PBCH DM	IRS to SSS						
EPRE ratio	of PBCH to F	PBCH DMRS	]					
EPRE ratio	of PDCCH D	MRS to SSS						
		PDCCH DMRS	dB 0					
	of PDSCH D		ub ub	U				
	of PDSCH to							
		IRS to SSS(Note 1)						
	of OCNG to	OCNG DMRS (Note						
1)								
$N_{oc}^{ m Note2}$			dBm/15kH		-6	8		
	0		Z			20		
$N_{oc}^{ m Note2}$	Config 1,2 Config 3		dBm/SCS		<u>-</u> -و 2-	)8 15		
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	Comig o		dB	8	-0.64	-Infinity	-0.64	
$\hat{E}_s/N_{oc}$			dB	8	8	-Infinity	8	
	Config 1,2		dBm/SCS	-90	-90	-Infinity	-90	
SSB_RP	Config 1,2		dBm/SCS	-87	-87	-Infinity	-87	
Io <sup>Note3</sup>	Config 1,2		dBm/ 9.36MHz	-61.41	-58.71	-61.41	-58.71	
	Config 3		dBm/ 38.16MHz	-55.31	-52.60	-55.31	-52.60	
	n condition		-	AW		AW		
Noto 1:	OCNG chall h	CNG shall be used such that both cells are fully allocated and a constant total transmitted nower sy				wor apoetral		

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

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

### A.6.3.1.2.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 282 ms from the beginning of time period T2. The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay + T<sub>interrupt</sub>, where:

RRC procedure delay = 50 ms and is specified in clause 12 in TS 38.331 [2].

 $T_{interrupt} = 232$  ms in the test.  $T_{interrupt}$  is defined in clause 6.1.1.2.2.

This gives a total of 282 ms.

### A.6.3.1.3 Inter-frequency handover from FR1 to FR1; unknown target cell

### A.6.3.1.3.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR1-NR FR1 inter frequency handover requirements specified in clause 6.1.1.2.

### A.6.3.1.3.2 Test Parameters

Supported test configurations are shown in table A.6.3.1.3.2-1. Both handover delay and interruption length are tested by using the parameters in table A.6.3.1.3.2-2, and A.6.3.1.3.2-3.

The test scenario comprises of two carriers and one cell on each carrier. No gap patterns are configured in the test case. The test consists of two successive time periods, with time durations of T1, T2 respectively. At the start of time duration T1, the UE does not have any timing information of cell 2. Starting T2, cell 2 becomes detectable and the UE receives a RRC handover command from the network. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

Table A.6.3.1.3.2-1: Inter-frequency handover from FR1 to FR1 test configurations

Config	Description				
1	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode				
	Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode				
2	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode				
	Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode				
3	Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode				
	Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode				
Note: The UE is or					

Table A.6.3.1.3.2-2: General test parameters Inter-frequency handover from FR1 to FR1

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
A3-Offset		dB	-4	
Hysteresis		dB	0	
Time To Trigger		S	0	
Filter coefficient			0	L3 filtering is not used
Access Barring In	formation	-	Not Sent	No additional delays in random
-				access procedure.
T1		S	5	
T2		s	≤5	

Table A.6.3.1.3.2-3: Cell specific test parameters for NR FR1-FR1 Inter frequency handover test case

Parameter		Unit		Cell 1		II 2
		Unit	T1	T2	T1	T2
NR RF Channel Number	per		1		2	2
Config 1			FDD			
Duplex mode	Config 2,3			TE	D	
	Config 1		Not Applicable			
TDD configuration	Config 2			TDDC	onf.1.1	
	Config 3		TDDConf.2.1			
	Config 1		10: N <sub>RB,c</sub> = 52			
BW <sub>channel</sub>	Config 2	MHz	10: N <sub>RB,c</sub> = 52			
	Config 3		40: N <sub>RB,c</sub> = 106			

		Config 1			10: No	<sub>B,c</sub> = 52		
BWP BW		Config 2	MHz		10. NRI	<sub>B,c</sub> = 52 <sub>B,c</sub> = 52		
DVVI DVV	Config 2 Config 3		IVII IZ			<sub>.c</sub> = 106		
		Config 1				<u>,c = 100</u> .1 FDD		
TRS configu	ıration	Config 2		TRS.1.1 TDD				
TKS cornige	iration	Config 3			TRS.1.1 TDD TRS.1.2 TDD			
DRx Cycle		Cornig 3	ms			plicable		
		Config 1	1113		SR.1.			
PDSCH Ref		Config 2				1 TDD		
measureme	nt channel	Config 3				I TDD		
		Config 1				1 FDD		
CORESET	Reference	Config 2				1 TDD		
Channel		Config 3				TDD		
OCNG Patte	erns	ooning o			OCNG p			
SMTC Conf						attern 1		
	•	Config 1,2			SSB.			
SSB Config	uration	Config 3			SSB.2			
PDSCH/PD	ССН	Config 1,2				kHz		
subcarrier s		Config 3	kHz			kHz		
PUCCH/PU		Config 1,2				kHz		
subcarrier s		Config 3	kHz			kHz		
PRACH con		1		FR1 PRACH configuration 1				
		Initial DL BWP			DLBWP.0.1			
		Dedicated DL			DLBWP.1.1			
D14/D		BWP						
BWP		Initial UL BWP			ULBV	/P.0.1		
		Dedicated UL			ULBWP.1.1			
		BWP						
EPRE ratio	of PSS to SS	SS						
EPRE ratio								
EPRE ratio	of PBCH to I	PBCH DMRS						
EPRE ratio	of PDCCH D	MRS to SSS						
		PDCCH DMRS	dB		0			
		MRS to SSS	QD.	U				
EPRE ratio								
		MRS to SSS(Note 1)						
	of OCNG to	OCNG DMRS (Note						
1)								
$N_{oc}^{$			dBm/15kH	-9	8	_9	98	
	0 5 15		Z					
	Config 1,2		4D == 1000	-9			98	
			dBm/SCS	-9			95	
$\hat{ extbf{E}}_{ ext{s}}/ ext{I}_{ ext{ot}}$		dB	4	4	-Infinity	5		
$\hat{E}_s/N_{oc}$		dB	4	4	-Infinity	5		
Config 1.2			dBm/SCS	-94	-94	-Infinity	-93	
	Config 3		dBm/SCS	-91	-91	-Infinity	-90	
	Config 1,2		dBm/ 9.36MHz	-64.59	-64.59	-70.05	-63.85	
Io <sup>Note3</sup>	Config 3		dBm/ 38.16MHz	-58.49	-58.49	-63.94	-57.75	
Propagation	condition		-	AW	GN	AW	/GN	
N 1 4 6		1 1 1 1 1 1						

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

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

### A.6.3.1.3.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 282 ms from the beginning of time period T2. The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay + T<sub>interrupt</sub>, where:

RRC procedure delay = 10 ms and is specified in clause 12 in TS 38.331 [2].

 $T_{interrupt} = 272$  ms in the test.  $T_{interrupt}$  is defined in clause 6.1.1.2.2.

This gives a total of 282 ms.

### A.6.3.1.4 SA NR - E-UTRAN handover

#### A.6.3.1.4.1 Test Purpose and Environment

The purpose of this set of tests is to verify that the UE can make correct inter-RAT E-UTRAN handover when operating in standalone (SA) operation with PCell in FR1. This test shall verify the NR to E-UTRAN handover requirements as specified in clause 6.1.2.1.

The test comprises of one NR carrier and one E-UTRA carrier. There are two cells and one cell on each carrier. Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN neighbour cell. The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable and the UE is expected to detect and send a measurement report. Gap pattern configuration with id #0 as specified in Table 9.1.2-1 is configured before T2 begins to enable inter-RAT frequency monitoring.

A RRC message implying handover shall be sent to the UE during period T2 after the UE has reported Event B2. The start of T3 is the instant when the last TTI containing the RRC message implying handover is sent to the UE. The handover message shall contain Cell 2 as the target cell.

Supported test configurations are shown in table A.6.3.1.4-1. General test parameters are provided in Table A.6.3.1.4-2. Cell specific test parameters for Cell 1 and Cell 2 are provided in Tables A.6.3.1.4-3 and A.6.3.1.4-4 respectively.

Table A.6.3.1.4-1: Supported test configurations for SA inter-RAT E-UTRAN handover tests

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

Table A.6.3.1.4-2: General test parameters for SA inter-RAT E-UTRAN handover

Parameter		Unit	Value	Comment
NR RF Channel Number			1	1 NR carrier frequency is used in the test
LTE RF Channel I	Number		2	1 E-UTRAN carrier frequency is used in the test
Initial conditions	Active cell		Cell 1	NR cell
	Neighbouring cell		Cell 2	E-UTRAN cell
Final condition	Active cell		Cell 2	
NR measurement	quantity		SS-RSRP	
E-UTRAN measur	ement quantity		RSRP	
b2-Threshold1		dBm	As specified in Table	Absolute NR SS-RSRP threshold
			A.6.3.1.4-3	for event B2
b2-Threshold2EU	TRAN	dBm	-98	Absolute E-UTRAN RSRP
				threshold for event B2
Hysteresis		dB	0	
TimeToTrigger		S	0	
Filter coefficient			0	L3 filtering is not used
DRX			OFF	Non-DRX test
Access Barring In	formation	-	Not sent	No additional delays in random
				access procedure
Time offset betwe	en cells		3 ms	Asynchronous cells
Gap pattern configuration Id			0	As specified in Table 9.1.2-1
3				started before T2 starts
T1		s	5	
T2		s	≤5	
T3		S	1	

Table A.6.3.1.4-3: Cell specific test parameters for SA inter-RAT E-UTRA handover (Cell 1)

Para	ameter	Unit	Configuration	Cell 1		
				T1	T2	Т3
RF channel num	RF channel number		1, 2, 3, 4, 5, 6		1	
Duplex mode			1, 4		FDD	
			2, 3, 5, 6		TDD	
TDD Configuration	on		2, 5		TDDConf.1.1	
			3, 6		TDDConf.1.2	
BW <sub>channel</sub>		MHz	1, 4	10:	$N_{RB,c} = 52 (FI$	DD)
			2, 5	10:	$N_{RB,c} = 52$ (TE	DD)
			3, 6	40:	$N_{RB,c} = 106 (T$	DD)
PDSCH reference	e measurement		1, 4		SR.1.1 FDD	
channel			2, 5		SR.1.1 TDD	
			3, 6		SR.2.1 TDD	
CORSET referer	nce channel		1, 4	CR.1.1 FDD		
			2, 5		CR.1.1 TDD	
			3, 6		CR.2.1 TDD	
TRS configuratio	n		1, 4		TRS.1.1 FDD	
			2, 5		TRS.1.1 TDD	
			3, 6		TRS.1.2 TDD	
OCNG pattern <sup>Not</sup>	e1		1, 2, 3, 4, 5, 6		OP.1	
	Initial DL BWP		1, 2, 3, 4, 5, 6		DLBWP.0.1	
BWP	Dedicated DL BWP				DLBWP.1.1	
DAAL	Initial UL BWP				ULBWP.0.1	
	Dedicated UL BWP				ULBWP.1.1	
SMTC configurat	ion		1, 2, 3, 4, 5, 6		SMTC.1	<u>-</u>

SSB configuration		1, 2, 4, 5		SSB.1 FR1	
		3, 6		SSB.2 FR1	
b2-Threshold1	dBm	1, 2, 4, 5		-96	
	иын	3, 6	-93		
EPRE ratio of PSS to SSS		1, 2, 3, 4, 5, 6			
EPRE ratio of PBCH_DMRS to SSS					
EPRE ratio of PBCH to					
PBCH_DMRS					
EPRE ratio of PDCCH_DMRS to					
SSS					
EPRE ratio of PDCCH to					
PDCCH_DMRS	dB			0	
EPRE ratio of PDSCH_DMRS to					
SSS					
EPRE ratio of PDSCH to					
PDSCH_DMRS					
EPRE ratio of OCNG DMRS to SSS					
EPRE ratio of OCNG to OCNG					
DMRS					
Noc <sup>Note2</sup>	dBm/15 KHz	1, 2, 3, 4, 5, 6		-100	
N <sub>oc</sub> Note2	dBm/SCS	1, 2, 4, 5		-100	
		3, 6		-97	
Ê <sub>s</sub> /N <sub>oc</sub>	dB	1, 2, 3, 4, 5, 6	012	0-4	0-4
Ê <sub>s</sub> /I <sub>ot</sub> <sup>Note3</sup>	dB	1, 2, 3, 4, 5, 6	012	0-4	0-4
SS-RSRP <sup>Note3</sup>	dBm/SCS	1, 2, 4, 5	-88	-104	-104
		3, 6	-85	-101	-101
	dBm/9.36	1, 2, 4, 5	-59.78	-70.59	-70.59
IoNote3	MHz				
10	dBm/38.16	3, 6	-53.68	-64.49	-64.49
	MHz				
Propagation condition		1, 2, 3, 4, 5, 6		AWGN	
Antenna Configuration and		1, 2, 3, 4, 5, 6		1x2 Low	
Correlation Matrix					

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

Ê<sub>s</sub>/l<sub>ot</sub>, SS-RSRP, and lo levels have been derived from other parameters for information purposes. Note 3:

They are not settable parameters themselves.

Table A.6.3.1.4-4: Cell specific test parameters for SA inter-RAT E-UTRA handover (Cell 2)

Parameter	Unit	Configuration	Cell 2			
			T1	T2	Т3	
RF channel number		1, 2, 3, 4, 5, 6		2		
Duplex mode		1, 2, 3		FDD		
-		4, 5, 6		TDD		
TDD special subframe configuration <sup>Note1</sup>		4, 5, 6	6			
TDD uplink-downlink configuration <sup>Note1</sup>		4, 5, 6	1			
BW <sub>channel</sub>	MHz	1, 2, 3, 4, 5, 6	$5 \text{ MHz: } N_{RB,c} = 25$ $10 \text{ MHz: } N_{RB,c} = 50$ $20 \text{ MHz: } N_{RB,c} = 100$			
PRACH		1, 2, 3	4			
Configuration <sup>Note2</sup>		4, 5, 6	53			
PDSCH parameters:		1, 2, 3	5 MHz: R.7 FDD 10 MHz: R.3 FDD			

DL Reference				20 MHz: R.6 FDD	
Measurement		4, 5, 6		5 MHz: R.4 TDD	
Channel <sup>Note3</sup>		4, 5, 0		10 MHz: R.0 TDD	
				20 MHz: R.3 TDD	
PCFICH/PDCCH/PHICH		1, 2, 3		5 MHz: R.11 FDD	
parameters:		1, 2, 0		10 MHz: R.6 FDD	
DL Reference				20 MHz: R.10 FDD	
Measurement		4, 5, 6		5 MHz: R.11 TDD	
Channel <sup>Note3</sup>		., 0, 0		10 MHz: R.6 TDD	
				20 MHz: R.10 TDD	
OCNG Patterns <sup>Note3</sup>		1, 2, 3		5 MHz: OP.20 FDD	
		, , -		10 MHz: OP.10 FDD	
				20 MHz: OP.17 FDD	)
		4, 5, 6		5 MHz: OP.9 TDD	
				10 MHz: OP.1 TDD	
				20 MHz: OP.7 TDD	
PBCH_RA		1, 2, 3, 4, 5, 6			
PBCH_RB					
PSS_RA					
SSS_RA					
PCFICH_RB					
PHICH_RA					
PHICH_RB	dB			0	
PDCCH_RA					
PDCCH_RB					
PDSCH_RA					
PDSCH_RB					
OCNG_RA <sup>Note4</sup>					
OCNG_RB <sup>Note4</sup>					
N <sub>oc</sub> Note5	dBm/15kHz	1, 2, 3, 4, 5, 6		-98	
Ê <sub>s</sub> /N <sub>oc</sub>	dB	1, 2, 3, 4, 5, 6	-Infinity	8	78
Ês/Iot <sup>Note6</sup>	dB	1, 2, 3, 4, 5, 6	-Infinity	78	78
RSRP <sup>Note6</sup>	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-90	-90
SCH_RPNote6	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-90	-90
Io <sup>Note6</sup>	dBm/9MHz	1, 2, 3, 4, 5, 6	-67.21	-58.57	-58.57
			+10log(N <sub>RB,c</sub> /100) +10log(N <sub>RB,c</sub> /100) +10log(N <sub>RB,c</sub> /100)		
Propagation Condition		1, 2, 3, 4, 5, 6	AWGN		
Antenna Configuration		1, 2, 3, 4, 5, 6	1x2 Low		
and Correlation Matrix Note7					

- Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].
- Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211 [23].
- Note 3: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.
- Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N<sub>oc</sub> to be fulfilled.
- Note 6:  $\hat{E}_s$ /I<sub>ot</sub>, RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 7: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25].

### A.6.3.1.4.2 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 85 ms from the beginning of time period T3.

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

NOTE: The handover delay can be expressed as: RRC procedure delay + T<sub>interrupt</sub>, where:

RRC procedure delay = 50 ms and is specified in clause 6.1.2.1.

 $T_{interrupt} = 35$  ms in the test;  $T_{interrupt}$  is defined in clause 6.1.2.1.

This gives a total of 85 ms.

### A.6.3.1.5 SA NR - E-UTRAN handover with unknown target cell

### A.6.3.1.5.1 Test Purpose and Environment

The purpose of this set of tests is to verify that the UE can make correct inter-RAT E-UTRAN handover when operating in standalone (SA) operation with PCell in FR1. This test shall verify the NR to E-UTRAN handover requirements for the case when the target E-UTRAN cell is unknown as specified in clause 6.1.2.1.

The test comprises of one NR carrier and one E-UTRA carrier. There are two cells and one cell on each carrier. Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN neighbour cell. The test consists of two successive time periods, with time durations of T1 and T2 respectively. At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable. No Gap pattern shall be configured.

A RRC message implying handover shall be sent to the UE during period T1. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE. The handover message shall contain Cell 2 as the target cell.

Supported test configurations are shown in table A.6.3.1.5-1. General test parameters are provided in Table A.6.3.1.5-2. Cell specific test parameters for Cell 1 and Cell 2 are provided in Tables A.6.3.1.5-3 and A.6.3.1.5-4 respectively.

Table A.6.3.1.5-1: Supported test configurations for SA inter-RAT E-UTRAN handover tests

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

Table A.6.3.1.5-2: General test parameters for SA inter-RAT E-UTRAN handover

Par	ameter	Unit	Value	Comment
NR RF Channel N	NR RF Channel Number		1	1 NR carrier frequency is used in
				the test
LTE RF Channel N	Number		2	1 E-UTRAN carrier frequency is
				used in the test
Initial conditions	Active cell		Cell 1	NR cell
	Neighbouring cell		Cell 2	E-UTRAN cell
Final condition	Active cell		Cell 2	
NR measurement	quantity		SS-RSRP	
DRX			OFF	Non-DRX test
Access Barring Inf	ormation	-	Not sent	No additional delays in random
				access procedure
Time offset between cells			3 ms	Asynchronous cells
T1		S	≤5	
T2		S	1	

Table A.6.3.1.5-3: Cell specific test parameters for SA inter-RAT E-UTRA handover (Cell 1)

Para	Parameter		Configuration		ell 1
			4 0 0 4 5 0	T1	T2
RF channel num	ber		1, 2, 3, 4, 5, 6		1
Duplex mode			1, 4		DD
TDD Configuration			2, 3, 5, 6		DD
TDD Configuration	on		2, 5		onf.1.1 onf.1.2
BW <sub>channel</sub>		MHz	3, 6 1, 4		= 52 (FDD)
DVVchannel		IVII IZ	2, 5		= 52 (FDD) = 52 (TDD)
			3, 6		: 106 (TDD)
PDSCH reference	e measurement		1, 4	SR 1	1 FDD
channel	o mododiomoni		2, 5		1 TDD
			3, 6	SR.2.	1 TDD
CORSET referer	nce channel		1, 4		1 FDD
			2, 5		1 TDD
			3, 6		1 TDD
TRS configuration	n		1, 4		.1 FDD
			2, 5		.1 TDD
			3, 6	TRS.1	.2 TDD
OCNG pattern <sup>Not</sup>	te1	_	1, 2, 3, 4, 5, 6		P.1
	Initial DL BWP		1, 2, 3, 4, 5, 6	DLBV	VP.0.1
	Dedicated DL BWP	-		DLBV	VP.1.1
BWP	Initial UL BWP	_		ULBV	VP.0.1
	Dedicated UL BWP	-		ULBV	VP.1.1
SMTC configurat	SMTC configuration		1, 2, 3, 4, 5, 6	SM	TC.1
	SSB configuration		1, 2, 4, 5		1 FR1
3-2 3-1gaa			3, 6		2 FR1
EPRE ratio of PS	SS to SSS		1, 2, 3, 4, 5, 6		
EPRE ratio of PE	BCH_DMRS to				
SSS	_				
EPRE ratio of PE	BCH to				
PBCH_DMRS					
EPRE ratio of PD	DCCH_DMRS to				
SSS	200111				
EPRE ratio of PE	OCCH to	dB			0
PDCCH_DMRS EPRE ratio of PE	DECH DMDC to	uБ			U
SSS	DOCH_DIVING IO				
EPRE ratio of PI	OSCH to	-			
PDSCH DMRS	0001110				
EPRE ratio of O	CNG DMRS to	=			
SSS					
	EPRE ratio of OCNG to OCNG				
DMRS		15 // = :	4.0.0.1.5.6		•
N <sub>oc</sub> Note2		dBm/15 KHz	1, 2, 3, 4, 5, 6		98
Noc <sup>Note2</sup>		dBm/SCS	1, 2, 4, 5 3, 6		98 95
Ê <sub>s</sub> /N <sub>oc</sub>		dB	1, 2, 3, 4, 5, 6	0	0
Ê <sub>s</sub> /I <sub>ot</sub> Note3	Ê <sub>s</sub> /I <sub>ot</sub> Note3		1, 2, 3, 4, 5, 6	0	0
SS-RSRP <sup>Note3</sup>		dB dBm/SCS	1, 2, 4, 5	-98	-98
	00 1.01.1		3, 6	-95	-95
			1, 2, 4, 5	-67.04	-67.04
Io <sup>Note3</sup>	Io <sup>Note3</sup>		3, 6	-60.94	-60.94
		dBm/38.16 MHz	Ο, Ο	33.01	33.01

Propagat	tion condition 1, 2, 3, 4, 5, 6 AWGN					
Antenna	Configuration and		1, 2, 3, 4, 5, 6	1x2 Low		
Correlation	on Matrix					
Note 1:	OCNG shall be used such	that both cells a	re fully allocated ar	nd a constant total transmitted power		
	spectral density is achieved for all OFDM symbols.					
Note 2:						
	fulfilled.					
Note 3:	Ê₅/lot, SS-RSRP, and lo levels have been derived from other parameters for information purposes.					
	They are not settable parameters themselves.					

Table A.6.3.1.5-4: Cell specific test parameters for SA inter-RAT E-UTRA handover (Cell 2)

T1	Parameter	Unit	Configuration	Cell 2
RF channel number			_	T4 T2
Duplex mode	RF channel number		123456	
1.2, 3				
TDD special subframe	Bupiex mode			
Configuration   Notes   Section	TDD enecial subframe			
Configuration   Note   BWchannel   MHz   1, 2, 3, 4, 5, 6   5 MHz: N <sub>RB,C</sub> = 25   10 MHz: N <sub>RB,C</sub> = 50   20 MHz: N <sub>RB,C</sub> = 100     PRACH Configuration   Note   4, 5, 6   53     PDSCH parameters:	configuration <sup>Note1</sup>			-
PRACH Configuration   Notes   20 MHz: NRB,c = 50   20 MHz: NRB,c = 100	configuration <sup>Note1</sup>			
PRACH Configuration   Note2   1, 2, 3   4	BW <sub>channel</sub>	MHz	1, 2, 3, 4, 5, 6	5 MHz: N <sub>RB,c</sub> = 25
PRACH Configuration   Note2   1, 2, 3   4   4, 5, 6   53				
PRACH Configuration   Note2   1, 2, 3   4   4, 5, 6   53				20 MHz: N <sub>RB,c</sub> = 100
PDSCH parameters: DL Reference Measurement ChannelNole3	PRACH Configuration <sup>Note2</sup>		1, 2, 3	
PDSCH parameters: DL Reference Measurement Channel Notes   1, 2, 3   5 MHz: R.7 FDD   10 MHz: R.3 FDD   20 MHz: R.6 FDD   20 MHz: R.6 FDD   4, 5, 6   5 MHz: R.4 TDD   10 MHz: R.0 TDD   20 MHz: R.3 TDD   20 MHz: R.3 TDD   20 MHz: R.3 TDD   20 MHz: R.3 TDD   20 MHz: R.11 FDD   20 MHz: R.11 FDD   20 MHz: R.10 FDD   20 MHz: R.10 FDD   20 MHz: R.10 FDD   20 MHz: R.10 TDD   20 MHz: R.6 TDD   20 MHz: R.10 TDD   20 MHz: R.6 TDD   20 MHz: R.10 TDD   20 MHz: R.10 TDD   20 MHz: R.0 FDD   20 MHz: R.0 FD				53
DL Reference Measurement ChannelNotes   20 MHz: R.3 FDD 20 MHz: R.4 FDD	PDSCH parameters:			5 MHz: R.7 FDD
Channel Note3			, , , ,	
A, 5, 6   5 MHz: R.4 TDD   10 MHz: R.0 TDD   20 MHz: R.3 TDD				
10 MHz; R.0 TDD   20 MHz; R.3 TDD			4. 5. 6	
Comparation			1, 0, 0	
PCFICH/PDCCH/PHICH parameters:				
Digital Reference Measurement	PCFICH/PDCCH/PHICH		1 2 3	
DL Reference Measurement			1, 2, 0	
ChannelNote3     4, 5, 6     5 MHz: R.11 TDD 10 MHz: R.6 TDD 20 MHz: R.10 TDD       OCNG PatternsNote3     1, 2, 3     5 MHz: OP.20 FDD 10 MHz: OP.10 FDD 20 MHz: OP.17 FDD 4, 5, 6       FBCH_RA     5 MHz: OP.9 TDD 10 MHz: OP.1 TDD 20 MHz: OP.7 TDD 20 MHz: OP.7 TDD       PBCH_RB     PSS_RA       PSS_RA     SSS_RA       PCFICH_RB     OP.7 TDD       PHICH_RA     OP.7 TDD       PDCCH_RB     OP.7 TDD       PDCCH_RB     OP.7 TDD       PDCCH_RB     OP.7 TDD       PDCCH_RB     OP.7 TDD       PDSCH_RB     OP.7 TDD       PDSCH_RB     OP.7 TDD       PDSCH_RB     OP.7 TDD       OCNG_RANote4     OP.7 TDD	·			
10 MHz: R.6 TDD   20 MHz: R.10 TDD			156	
CCNG PatternsNote3	Ondrine		4, 3, 0	
1, 2, 3   5 MHz: OP.20 FDD   10 MHz: OP.10 FDD   20 MHz: OP.17 FDD   4, 5, 6   5 MHz: OP.9 TDD   10 MHz: OP.1 TDD   20 MHz: OP.7 TDD   10 MHz: OP.7 TDD   20 MHz: O				
10 MHz: OP.10 FDD   20 MHz: OP.17 FDD   4, 5, 6   5 MHz: OP.9 TDD   10 MHz: OP.1 TDD   20 MHz: OP.1 TDD   20 MHz: OP.7 TDD	OCNC PottornoNote3		1 2 2	
20 MHz: OP.17 FDD	OCING Fallerits		1, 2, 3	
## A				
10 MHz: OP.1 TDD   20 MHz: OP.7 TDD			4 F G	
PBCH_RA PBCH_RB PSS_RA SSS_RA PCFICH_RB PHICH_RA PHICH_RB PDCCH_RA PDCCH_RA PDSCH_RA PDSCH_RA PDSCH_RB OCNG_RANote4			4, 5, 6	
PBCH_RA PBCH_RB PSS_RA SSS_RA PCFICH_RB PHICH_RA PHICH_RB DDCCH_RA PDCCH_RB PDSCH_RA PDSCH_RA PDSCH_RB OCNG_RANote4				
PBCH_RB PSS_RA SSS_RA PCFICH_RB PHICH_RA PHICH_RB DDCCH_RA PDCCH_RB PDSCH_RA PDSCH_RA PDSCH_RB OCNG_RANote4	DDOLL DA		1 0 0 1 5 0	20 MHZ: OP.7 TDD
PSS_RA  SSS_RA  PCFICH_RB  PHICH_RA  PHICH_RB  O  PDCCH_RA  PDCCH_RB  PDSCH_RA  PDSCH_RA  PDSCH_RB  OCNG_RANote4			1, 2, 3, 4, 5, 6	
SSS_RA PCFICH_RB PHICH_RA PHICH_RB DDCCH_RA PDCCH_RB PDSCH_RA PDSCH_RA PDSCH_RB OCNG_RANote4				
PCFICH_RB PHICH_RA PHICH_RB O PDCCH_RA PDCCH_RB PDSCH_RA PDSCH_RA PDSCH_RB OCNG_RANote4				
PHICH_RA           PHICH_RB         dB           PDCCH_RA           PDCCH_RB           PDSCH_RA           PDSCH_RB           OCNG_RANote4				
PHICH_RB				
PDCCH RA PDCCH RB PDSCH RA PDSCH RB OCNG RA <sup>Note4</sup>				
PDCCH_RB PDSCH_RA PDSCH_RB OCNG_RA <sup>Note4</sup>		dB		0
PDSCH_RA PDSCH_RB OCNG_RANote4				
PDSCH_RB OCNG_RA <sup>Note4</sup>				
OCNG RA <sup>Note4</sup>	PDSCH_RA			
OCNG_RA <sup>Note4</sup> OCNG_RB <sup>Note4</sup>				
OCNG RBNote4	OCNG_RA <sup>Note4</sup>			
	OCNG_RB <sup>Note4</sup>			

N <sub>oc</sub> Note5	dBm/15kHz	1, 2, 3, 4, 5, 6	-9	98	
Ês/Noc	dB	1, 2, 3, 4, 5, 6	-Infinity	7	
Ês/I <sub>ot</sub> Note6	dB	1, 2, 3, 4, 5, 6	-Infinity	7	
RSRP <sup>Note6</sup>	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-91	
SCH_RPNote6	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-91	
Io <sup>Note6</sup>	dBm/9MHz	1, 2, 3, 4, 5, 6	-70.22	-62.43	
Propagation Condition		1, 2, 3, 4, 5, 6	AW	'GN	
Antenna Configuration and		1, 2, 3, 4, 5, 6	1x2 Low		
Correlation Matrix Note7				50.00.044.5001	

- Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].
- Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211 [23].
- Note 3: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.
- Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N<sub>oc</sub> to be fulfilled.
- Note 6: Ê<sub>s</sub>/I<sub>ot</sub>, RSRP, SCH\_RP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 7: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25].

### A.6.3.1.5.2 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 165 ms from the beginning of time period T2.

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

NOTE: The handover delay can be expressed as: RRC procedure delay + T<sub>interrupt</sub>, where:

RRC procedure delay = 50 ms and is specified in clause 6.1.2.1.

 $T_{interrupt} = 115$  ms in the test;  $T_{interrupt}$  is defined in clause 6.1.2.1.

This gives a total of 165 ms.

# A.6.3.2 RRC Connection Mobility Control

### A.6.3.2.1 SA: RRC Re-establishment

### A.6.3.2.1.1 Intra-frequency RRC Re-establishment in FR1

### A.6.3.2.1.1.1 Test Purpose and Environment

The purpose is to verify that the NR intra-frequency RRC re-establishment delay in FR1 with known target cell is within the specified limits. These tests will verify the requirements in clause 6.2.1.

The test parameters are given in table A.6.3.2.1.1.1-1, table A.6.3.2.1.1.1-2 and table A.6.3.2.1.1.1-3 below. The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell, is deactivated. The time period T3 starts after the occurrence of the radio link failure.

Table A.6.3.2.1.1.1-1: Supported test configurations

Configuration	Description				
1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode				
2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode				
3	30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode				
Note: The UE is only required to be tested in one of the supported test configurations.					

Table A.6.3.2.1.1.1-2: General test parameters for NR intra-frequency RRC Re-establishment test case in FR1

	Parameter Unit co		Test configuration	Value	Comment
Initial	Active cell		1, 2, 3	Cell1	
condition	Neighbour cells		1, 2, 3	Cell2	
Final condition	Active cell		1, 2, 3	Cell2	
RF Channe	el Number		1, 2, 3	1	
Time offse	t between cells		1	3 ms	Asynchronous cells
			2	3 μs	Synchronous cells
			3	3 μs	Synchronous cells
N310		-	1, 2, 3	1	Maximum consecutive out-of-sync indications from lower layers
N311	-		1, 2, 3	1	Minimum consecutive in-sync indications from lower layers
T310		ms	1, 2, 3	0	Radio link failure timer; T310 is disabled
T311		ms	1, 2, 3	3000	RRC re-establishment timer
Access Ba	rring Information	-	1, 2, 3	Not Sent	No additional delays in random access procedure.
SSB config	guration		1	SSB.1 FR1	
			2	SSB.1 FR1	
			3	SSB.2 FR1	
SMTC con	figuration		1	SMTC	
				pattern 2	
			2	SMTC	
				pattern 1	
			3	SMTC	
DDV 1.1.			4.0.0	pattern 1	
DRX cycle length PRACH configuration index		S	1, 2, 3	OFF	The detailed configuration is an estimation
	miguration index		1, 2, 3	102	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
T1		S	1, 2, 3	5	
T2		ms	1, 2, 3	200	Time for the UE to detect RLF
T3		S	1, 2, 3	2	

Table A.6.3.2.1.1.1-3: Cell specific test parameters for NR intra-frequency RRC Re-establishment test case in FR1

Parameter	Unit	Test		Cell 1			Cell 2		
		configuration	T1	T2	Т3	T1	T2	Т3	
TDD configuration		1		N/A			N/A		
		2	Т	DDConf.1.	1	TDDConf.1.1			
		3	Т	DDConf.2.	1	Т	DDConf.2	.1	
PDSCH RMC		1	5	SR.1.1 FDD	)		N/A		
configuration		2	5	SR.1.1 TDD					
-		3		SR.2.1 TDD					
RMSI CORESET		1		CR.1.1 FDC	)		CR.1.1 FDI	)	
RMC configuration		2		CR.1.1 TDD			CR.1.1 TDI		
· ·		3		CR.2.1 TDD			CR.2.1 TDI		
Dedicated CORESET		1		CR.1.1 FDI			CR.1.1 FD		
RMC configuration		2		CR.1.1 TDI			CR.1.1 TD		
S		3		CR.2.1 TDI			CR.2.1 TD		
OCNG Pattern		1, 2, 3		defined in A			defined in A		
TRS configuration		1		RS.1.1 FDI			N/A		
ga.aaa.		2		RS.1.1 TDI					
		3		RS.1.2 TDI					
Initial DL BWP		1, 2, 3		DLBWP.0.1		Г	DLBWP.0.	1	
configuration		1, 2, 0	DLDWF.U.1 DLBWP.U.1				•		
Initial UL BWP		1, 2, 3	ULBWP.0.1			ı	ULBWP.0.1		
configuration		1, 2, 0	OLDVVI .O.1			025*** :0: :			
Active DL BWP		1, 2, 3	DLBWP.	N/A	N/A	N/A	N/A	DLBW	
confgiuration		1, 2, 0	1.1	14//	14// (	14//	14//	P.1.1	
Active UL BWP		1, 2, 3	ULBWP.	N/A	N/A	N/A	N/A	ULBW	
configuration		1, 2, 0	1.1	14//	14// (	14//	14//	P.1.1	
RLM-RS		1, 2, 3		SSB			SSB		
$\hat{E}_s/I_{ot}$	dB	1	1.54	-infinity	-infinity	-3.79	4	4	
L <sub>s</sub> /I <sub>ot</sub>	Q.D	2	1.0.			0.70			
		3	1						
3.7	dBm/SCS	1		1	-98	l			
$N_{oc}^{}$ Note2	dDIII/000	2			-98				
		3			-96 -95				
	dBm/15 kHz	1			-93 -98				
$N_{oc}$ Note2	UDITI/ TO KITZ	2	-		-90				
		3	-						
£ /27	dB	1	7	-infinity	-infinity	4	4	4	
$\hat{E}_s/N_{oc}$	UD	2	· '	-initiality	-irillility	4	4	4	
			-						
SS-RSRP Note3	4D/CCC	3	04	in finite.	in finite.	0.4	0.4	0.4	
55-R5RP Notes	dBm/SCS	1	-91	-infinity	-infinity	-94	-94	-94	
		2	-91	-infinity	-infinity	-94	-94	-94	
	ID (0.00 M)	3	-88	-infinity	-infinity	-91	-91	-91	
lo	dBm/9.36 MHz	1	-60.74	-64.59	-64.59	-60.74	-64.59	-64.59	
	dBm/9.36 MHz	2	-60.74	-64.59	-64.59	-60.74	-64.59	-64.59	
	dBm/38.16 MHz	3	-54.65	-58.50	-58.50	-54.65	-58.50	-58.50	
Propagation Condition		1, 2, 3			AWG	N			

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers

and time and shall be modelled as AWGN of appropriate power for  $N_{\it oc}$  to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

### A.6.3.2.1.1.2 Test Requirements

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to a known NR intra frequency cell shall be less than 1.6 s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

$$T_{re\text{-establish delay}} = T_{UL \text{ grant}} + T_{UE \text{ re-establish delay}}$$

Where:

 $T_{UL\_grant} = It$  is the time required to acquire and process uplink grant from the target cell. The PRACH reception at the system simulator is used as a trigger for the completion of the test; hence  $T_{UL\_grant}$  is not used

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

$$N_{\text{freq}} = 1$$

$$T_{identify intra NR} = 200 ms$$

 $T_{SI} = 1280$  ms; it is the time required for receiving all the relevant system information as defined in TS 38.331 for the target intra-frequency NR cell.

T<sub>PRACH</sub> = 15 ms; it is the additional delay caused by the random access procedure.

This gives a total of 1545 ms, allow 1.6 s in the test case.

#### A.6.3.2.1.2 Inter-frequency RRC Re-establishment in FR1

#### A.6.3.2.1.2.1 Test Purpose and Environment

The purpose is to verify that the NR inter-frequency RRC re-establishment delay in FR1 without known target cell is within the specified limits. These tests will verify the requirements in clause 6.2.1.

The test parameters are given in table A.6.3.2.1.2.1-1, table A.6.3.2.1.2.1-2 and table A.6.3.2.1.2.1-3 below. The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell, becomes inactive. The time period T3 starts after the occurrence of the radio link failure. During T1, the UE shall be configured with the carrier frequency of cell 2 (with RF Channel Number #2) to ensure that the UE has the context of the carrier frequency of cell 2 by the end of T1.

Table A.6.3.2.1.2.1-1: Supported test configurations

Configuration	Description of serving cell	Description of target cell			
1	15 kHz SSB SCS, 10 MHz bandwidth, FDD	15 kHz SSB SCS, 10 MHz bandwidth, FDD			
	duplex mode	duplex mode			
2	15 kHz SSB SCS, 10 MHz bandwidth, TDD	15 kHz SSB SCS, 10 MHz bandwidth, TDD			
	duplex mode	duplex mode			
3	30 kHz SSB SCS, 40 MHz bandwidth, TDD	30 kHz SSB SCS, 40 MHz bandwidth, TDD			
	duplex mode	duplex mode			
Note: The UE is only required to be tested in one of the supported test configurations.					

Table A.6.3.2.1.2.1-2: General test parameters for NR inter-frequency RRC Re-establishment test case in FR1

	Parameter	Unit	Test configuration	Value	Comment
Initial	Active cell		1, 2, 3	Cell1	
condition	Neighbour cells		1, 2, 3	Cell2	
Final condition	Active cell		1, 2, 3	Cell2	
RF Channe	el Number		1, 2, 3	1, 2	
Time offset	between cells		1	3 ms	Asynchronous cells
			2	3 μs	Synchronous cells
			3	3 μs	Synchronous cells
N310		-	1, 2, 3	1	Maximum consecutive out-of-sync indications from lower layers
N311		-	1, 2, 3	1	Minimum consecutive in-sync indications from lower layers
T310		ms	1, 2, 3	0	Radio link failure timer; T310 is disabled
T311		ms	1, 2, 3	5000	RRC re-establishment timer
Access Ba	rring Information	-	1, 2, 3	Not Sent	No additional delays in random access procedure.
SSB config	uration		1	SSB.1 FR1	
			2	SSB.1 FR1	
			3	SSB.2 FR1	
SMTC con	figuration		1	SMTC	
				pattern 2	
			2	SMTC	
				pattern 1	
			3	SMTC	
			4.0.0	pattern 1	
DRX cycle length		S	1, 2, 3	OFF	
	nfiguration index		1, 2, 3	102	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
T1		S	1, 2, 3	5	
T2		ms	1, 2, 3	200	Time for the UE to detect RLF
T3		S	1, 2, 3	5	

Table A.6.3.2.1.2.1-3: Cell specific test parameters for NR inter-frequency RRC Re-establishment test case in FR1

Parameter	Unit	Test		Cell 1		Cell 2		
		configuration	T1	T2	Т3	T1	T2	Т3
RF Channel Number		1, 2, 3		1			2	
TDD configuration		1		N/A			N/A	
		2	Т	DDConf.1.		Т	DDConf.1.	1
		3	Т	DDConf.2.		Т	DDConf.2.	1
PDSCH RMC		1	Ç	SR.1.1 FDD			N/A	
configuration		2	SR.1.1 TDD					
		3	SR.2.1 TDD			1		
RMSI CORESET		1	(	CR.1.1 FDD			R.1.1 FDE	)
RMC configuration		2	(	CR.1.1 TDD		C	R.1.1 TDE	)
		3	(	CR.2.1 TDD			R.2.1 TDE	)
Dedicated CORESET		1	CCR.1.1 FDD CCR.1.1 FDD			D		
RMC configuration	C configuration		CCR.1.1 TDD CCR.1.1 TDD			D		
		3	С	CR.2.1 TDI	)	C	CR.2.1 TD	D
OCNG Pattern		1, 2, 3	OP.1 defined in A.3.2.1 OP.1 defined in A.3.2.1					A.3.2.1
TRS configuration		1	TRS.1.1 FDD N/A					

		2	TI	RS.1.1 TDI	)			
		3	TRS.1.2 TDD					
Initial DL BWP		1, 2, 3	DLBWP.0 DLBWP.0					
configuration								
Initial UL BWP		1, 2, 3		ULBWP.0			ULBWP.0	
configuration								
Active DL BWP		1, 2, 3	DLBWP.	N/A	N/A	N/A	N/A	DLBW
confgiuration			1.1					P.1.1
Active UL BWP		1, 2, 3	ULBWP.	N/A	N/A	N/A	N/A	ULBW
configuration			1.1					P.1.1
RLM-RS		1, 2, 3		SSB			SSB	
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	1	4	-infinity	-infinity	-infinity	-infinity	7
37 00		2						
		3						
$N_{oc}$ Note2	dBm/SCS	1			-98			
oc Note2		2			-98			
		3			-95			
$N_{oc}$ Note2	dBm/15 kHz	1			-98			
TV <sub>oc</sub> Noice		2						
		3						
$\hat{E}_s/N_{oc}$	dB	1	4	-infinity	-infinity	-infinity	-infinity	7
37 00		2						
		3						
SS-RSRP Note3	dBm/SCS	1	-94	-infinity	-infinity	-infinity	-infinity	-91
		2	-94	-infinity	-infinity	-infinity	-infinity	-91
		3	-91	-infinity	-infinity	-infinity	-infinity	-88
lo	dBm/9.36 MHz	1	-64.59	-70.05	-70.05	-70.05	-70.05	-62.26
	dBm/9.36 MHz	2	-64.59	-70.05	-70.05	-70.05	-70.05	-62.26
	dBm/38.16 MHz	3	-58.50	-63.94	-63.94	-63.94	-63.94	-56.15
Propagation		1, 2, 3	AWGN					
Condition								

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers

and time and shall be modelled as AWGN of appropriate power for  $^{N_{oc}}$  to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

#### A.6.3.2.1.2.2 Test Requirements

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to an unknown NR inter frequency cell shall be less than 3 s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

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

Where:

 $T_{UL\_grant}$  = It is the time required to acquire and process uplink grant from the target cell. The PRACH reception at the system simulator is used as a trigger for the completion of the test; hence  $T_{UL\_grant}$  is not used.

$$T_{UE\_re-establish\_delay} = 50 \; ms + T_{identify\_intra\_NR} + \sum\nolimits_{i=1}^{Nfreq-1} T_{identify\_inter\_NR,i} + T_{SI-NR} + T_{PRACH}$$

 $N_{\text{freq}} = 2\,$ 

 $T_{identify intra NR} = 800 \text{ ms}$ 

 $T_{identify inter NR} = 800 \text{ ms}$ 

T<sub>SI</sub> = 1280 ms; it is the time required for receiving all the relevant system information as defined in TS 38.331 for the target inter-frequency NR cell.

T<sub>PRACH</sub> = 15 ms; it is the additional delay caused by the random access procedure.

This gives a total of 2945 ms, allow 3 s in the test case.

### A.6.3.2.1.3 Intra-frequency RRC Re-establishment in FR1 without serving cell timing

#### A.6.3.2.1.3.1 Test Purpose and Environment

The purpose is to verify that the NR intra-frequency RRC re-establishment delay in FR1 without serving cell timing is within the specified limits. These tests will verify the requirements in clause 6.2.1.

The test parameters are given in table A.6.3.2.1.3.1-1, table A.6.3.2.1.3.1-2 and table A.6.3.2.1.3.1-3 below. The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell, is deactivated. The time period T3 starts after the occurrence of the radio link failure.

Table A.6.3.2.1.3.1-1: Supported test configurations

Confi	Configuration Description					
1		15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode				
2		15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode				
3		30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode				
Note: T	Note: The UE is only required to be tested in one of the supported test configurations.					

Table A.6.3.2.1.3.1-2: General test parameters for NR intra-frequency RRC Re-establishment test case in FR1

Parameter		Unit	Test	Value	Comment		
Initial	A ative a all		configuration	Cell1			
	Active cell		1, 2, 3				
condition	Neighbour cells		1, 2, 3	Cell2			
Final condition	Active cell		1, 2, 3	Cell2			
RF Channel Number			1, 2, 3	1			
Time offset	t between cells		1	3 ms	Asynchronous cells		
			2	3 μs	Synchronous cells		
			3	3 μs	Synchronous cells		
N310		-	1, 2, 3	1	Maximum consecutive out-of-sync indications from lower layers		
	N311		1, 2, 3	1	Minimum consecutive in-sync indications from lower layers		
T310		ms	1, 2, 3	6000	Radio link failure timer configured by RLF-TimersAndConstants		
T311		ms	1, 2, 3	3000	RRC re-establishment timer		
Access Ba	Access Barring Information		1, 2, 3	Not Sent	No additional delays in random access		
					procedure.		
SSB config	SSB configuration		1	SSB.1 FR1			
			2	SSB.1 FR1			
			3	SSB.2 FR1			
SMTC con	figuration		1	SMTC			
				pattern 2			
			2	SMTC			
				pattern 1			
			3	SMTC			
				pattern 1			
DRX cycle length		S	1, 2, 3	OFF			
PRACH configuration index			1, 2, 3	102	The detailed configuration is specified in clause 6.3.3.2 of TS 38.211 [6]		
T1		S	1, 2, 3	5			
T2		s	1, 2, 3	6	Time for the UE to detect RLF		
T3		S	1, 2, 3	3			

Table A.6.3.2.1.3.1-3: Cell specific test parameters for NR intra-frequency RRC Re-establishment test case in FR1

Parameter	Unit	Test	Cell 1			Cell 2		
		configuration	T1	T2	Т3	T1	T2	T3
TDD configuration		1		N/A			N/A	
		2	TDDConf.1.1		TDDConf.1.1			
		3	TDDConf.2.1		TDDConf.2.1		1	
PDSCH RMC		1	SR.1.1 FDD		N/A			
configuration		2	SR.1.1 TDD					
		3	SR.2.1 TDD					
RMSI CORESET		1	CR.1.1 FDD			CR.1.1 FDD		
RMC configuration		2	CR.1.1 TDD		CR.1.1 TDD			
		3	CR.2.1 TDD			CR.2.1 TDD		
Dedicated CORESET		1	CCR.1.1 FDD		CCR.1.1 FDD			
RMC configuration		2	CCR.1.1 TDD		CCR.1.1 TDD			
		3	CCR.2.1 TDD		CCR.2.1 TDD			
OCNG Pattern			OP.1 defined in A.3.2.1		OP.1 defined in A.3.2.1			
Initial DL BWP		1, 2, 3 1, 2, 3	DLBWP.0.1		DLBWP.0.1			
configuration		, ,						
Initial UL BWP		1, 2, 3	ULBWP.0.1		ULBWP.0.1			
configuration		, ,						
RLM-RS		1, 2, 3	SSB		SSB			
$\hat{E}_{s}/I_{ot}$	dB	1	4	-infinity	-infinity	-infinity	-infinity	4
s / ot		2			-	_		
		3						
M Note2	dBm/SCS	1	-98					
$N_{oc}$ Note2		2	-98					
		3			-95			
M Note2	dBm/15 kHz	1	-98					
$N_{oc}$ Note2		2						
		3						
$\hat{E}_s/N_{oc}$	dB	1	4	-infinity	-infinity	-infinity	-infinity	4
87 60		2		_	-	_	-	
		3						
SS-RSRP Note3	dBm/SCS	1	-94	-infinity	-infinity	-infinity	-infinity	-94
		2	-94	-infinity	-infinity	-infinity	-infinity	-94
		3	-91	-infinity	-infinity	-infinity	-infinity	-91
lo	dBm/9.36 MHz	1	-64.59	-infinity	-infinity	-infinity	-infinity	-64.59
	dBm/9.36 MHz	2	-64.59	-infinity	-infinity	-infinity	-infinity	-64.59
	dBm/38.16 MHz	3	-58.50	-infinity	-infinity	-infinity	-infinity	-58.50
Propagation Condition		1, 2, 3	AWGN					

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers

and time and shall be modelled as AWGN of appropriate power for  $\frac{N_{oc}}{N_{oc}}$  to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

### A.6.3.2.1.3.2 Test Requirements

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to an unknown NR intra frequency cell without serving cell timing shall be less than 2.2 s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

$$T_{re\text{-establish delay}} = T_{UL \text{ grant}} + T_{UE \text{ re-establish delay}}.$$

Where:

 $T_{UL\_grant} = It$  is the time required to acquire and process uplink grant from the target cell. The PRACH reception at the system simulator is used as a trigger for the completion of the test; hence  $T_{UL\_grant}$  is not used

$$T_{UE\_re-establish\_delay} = 50 \; \text{ms} + T_{identify\_intra\_NR} + \sum\nolimits_{i=1}^{Nfreq-1} T_{identify\_inter\_NR,i} + T_{SI-NR} + T_{PRACH}$$

 $N_{freq} = 1$ 

 $T_{identify intra NR} = 800 \text{ ms}$ 

 $T_{SI} = 1280$  ms; it is the time required for receiving all the relevant system information as defined in TS 38.331 [2] for the target intra-frequency NR cell.

 $T_{PRACH}$  = 15 ms; it is the additional delay caused by the random access procedure.

This gives a total of 2145 ms, allow 2.2 s in the test case.

### A.6.3.2.2 Random Access

### A.6.3.2.2.1 Contention based random access test in FR1 for NR standalone

#### A.6.3.2.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will verify the requirements in Clause 6.2.2.2 and Clause 7.1.2 in an AWGN model.

For this test one cell is used and configured as PCell in FR1. Supported test parameters are shown in Table A.6.3.2.2.1.1-1. UE capble of SA with PCell in FR1 needs to be tested by using the parameters in Table A.6.3.2.2.1.1-2.

Table A.6.3.2.2.1.1-1: Supported test configurations for contention based random access test in FR1 for NR standalone

Config	Description				
1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode				
2	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode				
	The UE is only required to be tested in one of the supported test configurations depending on UE capability				

Table A.6.3.2.2.1.1-2: General test parameters for contention based random access test in FR1 for NR Standalone

Parameter		Unit	Test-1	Comments		
SSB Configuration		Config 1 Config 2		SSB pattern 1 in FR1	As defined in A.3.10,	
	· ·			SSB pattern 2 in FR1	except for number of	
					SSBs per SS-burst and	
					SS/PBCH block index as	
	<u> </u>				below	
Number of SS	SBs per SS	3-burst		2	Different from the	
SS/PBCH blo	ok indov			0,1	definition in A.3.10 Different from the	
33/FBCH 010	CK IIIUEX			0,1	definition in A.3.10	
Duplex Mode	Duplex Mode for Cell 2 Config 1			FDD	delimitori in A.S. 10	
2 4 1 1 1 1 1 1		Config 2	-	TDD	1	
TDD Configur	ation	Config 2		TDDConf.1.2		
OCNG Patter	n <sup>Note 1</sup>	, - J		OCNG pattern 1	As defined in A.3.2.1.	
PDSCH parar		Config 1		SR.1.1 FDD	As defined in A.3.1.1.	
Note 4		Config 2		SR.2.1 TDD		
NR RF Chanr	nel Numbe	r		1		
EPRE ratio of			dB			
EPRE ratio of	PBCH_DI	MRS to SSS	dB			
EPRE ratio of	PBCH to	PBCH_DMRS	dB			
		DMRS to SSS	dB	0		
		PDCCH_DMRS	dB			
		DMRS to SSS	dB			
EPRE ratio of		PDSCH_DMRS	dB			
000:45	$\hat{E_s}/I_{ot}$		dB	3	Power of SSB with index	
SSB with index 0	$N_{oc}$	Config 1	dBm/15kHz	-98	0 is set to be above configured <i>rsrp- ThresholdSSB</i>	
index o	1 oc	Config 2	]	-101		
	$\hat{E_s}/N_{oc}$		dB	3		
	SS-RSR	P Note 3	dBm/ SCS	-95		
	$\hat{E}_s/I_{ot}$		dB	-17	Power of SSB with index	
SSB with index 1	$N_{oc}$	Config 1	dBm/15kHz	-98	1 is set to be below configured <i>rsrp-</i>	
index i	<sup>1</sup> V <sub>oc</sub>	Config 2	-	-101	ThresholdSSB	
	$\hat{E_s}/N_{oc}$	-	dB	-17		
	SS-RSRP Note 3		dBm/ SCS	-115	1	
	Config 1		dBm	-65.3/9.36MHz	For symbols without SSB	
lo Note 2		Config 2		-62.2/38.16MHz	index 1	
		dBm/ SCS	-5	As defined in clause		
ss-PBCH-BlockPower				6.3.2 in TS 38.331 [2].		
Configured U	Configured UE transmitted power (		dBm	23	As defined in clause	
$P_{ m CMAX,f,c})$				6.2.4 in TS 38.101-1.		
PRACH Configuration			FR1 PRACH configuration 1	As defined in A.3.x.		
	Propagation Condition			AWGN		
N 1 4 00	NIO 1 III				*** 1	

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.

Note 2: SS-RSRP, Es/lot and lo levels have been derived from other parameters for information purpose. They are not settable parameters.

Note 3: Void

Note 4: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.

### A.6.3.2.2.1.2 Test Requirements

Contention based random access is triggered by *not* explicitly assigning a random access preamble via dedicated signalling in the downlink.

#### A.6.3.2.2.1.2.1 Random Access Preamble Transmission

To test the UE behavior specified in Clause 6.2.2.2.1.1 the System Simulator shall receive the Random Access Preamble which belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured *rsrp-ThresholdSSB*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

### A.6.3.2.2.1.2.2 Random Access Response Reception

To test the UE behavior specified in Clause 6.2.2.2.1.2 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response *not* corresponding to the transmitted Random Access Preamble.

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

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

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

### A.6.3.2.2.1.2.3 No Random Access Response Reception

To test the UE behavior specified in clause 6.2.2.2.1.3 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preambles.

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

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

### A.6.3.2.2.1.2.4 Receiving an UL grant for msg3 retransmission

To test the UE behavior specified in clause 6.2.2.2.1.4 the System Simulator shall provide an UL grant for msg3 retransmission following a successful Random Access Response.

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

#### A.6.3.2.2.1.2.5 Reception of an Incorrect Message over Temporary C-RNTI

To test the UE behavior specified in Clause 6.2.2.2.1.5 the System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element *not* matching the CCCH SDU transmitted in msg3 uplink message.

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

## A.4.3.2.2.1.2.6 Reception of a Correct Message over Temporary C-RNTI

To test the UE behavior specified in Clause 6.2.2.2.1.5 the System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element matching the CCCH SDU transmitted in the msg3 uplink message.

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

#### A.6.3.2.2.1.2.7 Contention Resolution Timer expiry

To test the UE behavior specified in Clause 6.2.2.2.1.6 the System Simulator shall *not* send a response to a msg3.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if the Contention Resolution Timer expires.

### A.6.3.2.2.2 Non-Contention based random access test in FR1 for NR standalone

## A.6.3.2.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will verify the requirements in Clause 6.2.2.2 and Clause 7.1.2 in an AWGN model.

For this test one cell is used and configured as PCell in FR1. Supported test parameters are shown in Table A.6.3.2.2.2.1-1. UE capble of SA with PCell in FR1 needs to be tested by using the parameters in Table A.6.3.2.2.2.1-2 for SSB-based non-contention based random access test (Test 1) and CSI-RS-based non-contention based random access test (Test 2).

Table A.6.3.2.2.2.1-1: Supported test configurations for non-contention based random access test in FR1 for NR standalone

	Config	Description
	1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
	2	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note:	The UE is only re capability	equired to be tested in one of the supported test configurations depending on UE

Table A.6.3.2.2.2.1-2: General test parameters for non-contention based random access test in FR1 for NR Standalone

	Paramet	ter	Unit	Test-1	Test-2	Comments
SSB Configu	ration	Config 1		SSB pattern 1 in	SSB pattern 1 in	As defined in
				FR1	FR1	A.3.10, except for
		Config 2		SSB pattern 2 in	SSB pattern 2 in	number of SSBs per
				FR1	FR1	SS-burst and SS/PBCH block
						index as below
Number of S	SBs per SS	-burst		2	2	Different from the
	ps			_	_	definition in A.3.10
SS/PBCH blo	ock index			0,1	0,1	Different from the
				·		definition in A.3.10
CSI-RS Conf	figuration	Config 1		N/A	CSI-RS.1.1 FDD	As defined in
		Config 2			CSI-RS.2.1 TDD	A.3.1.4
Duplex Mode	e for Cell 2	Config 1		FDD	FDD	
TDD 0		Config 2		TDD	TDD	
TDD Configu	iration Note 1	Config 2		TDDConf.1.2	TDDConf.1.2	AI - fiI i
OCNG Patte				OCNG pattern 1	OCNG pattern 1	As defined in A.3.2.1.
PDSCH para	ımeters	Config 1		SR.1.1 FDD	SR.1.1 FDD	As defined in
Note 4		Config 2		SR.2.1 TDD	SR.2.1 TDD	A.3.1.1.
NR RF Chan				1	1	
EPRE ratio o			dB			
EPRE ratio o			dB			
		PBCH_DMRS	dB	•	0	
		OMRS to SSS	dB	0	0	
		PDCCH_DMRS  OMRS to SSS	dB dB			
		PDSCH DMRS	dB			
LI IXL IAIIO C	$\hat{E_s}/I_{ot}$		dB	3	3	Power of SSB with
SSB with		Config 1	dBm/15kHz	-98	-98	index 0 is set to be
index 0	$N_{oc}$		UBIII/ ISKHZ			above configured
		Config 2		-101	-101	rsrp-ThresholdSSB
	$\hat{E}_s/N_{oc}$		dB	3	3	
	SS-RSRP Note 3		dBm/ SCS	-95	-95	
	$\hat{E_s}/I_{ot}$		dB	-17	-17	Power of SSB with
SSB with index 1	$N_{oc}$	Config 1	dBm/15kHz	-98	-98	index 1 is set to be below configured
		Config 2		-101	-101	rsrp-ThresholdSSB
	$\hat{E_s}/N_{oc}$		dB	-17	-17	
	SS-RSRI	P Note 3	dBm/ SCS	-115	-115	
I Note 2	•	Config 1	dBm	-65.3/9.36MHz	-65.3/9.36MHz	For symbols without
lo Note 2		Config 2	1	-62.2/38.16MHz	-62.2/38.16MHz	SSB index 1
ss-PBCH-BlockPower		dBm/ SCS	-5	-5	As defined in clause 6.3.2 in TS 38.331 [2].	
Configured UE transmitted power ( $P_{ m CMAX,fc}$ )		dBm	23	23	As defined in clause 6.2.4 in TS 38.101- 1.	
PRACH Con	figuration			FR1 PRACH	FR1 PRACH	As defined in
				configuration 2	configuration 3	A.3.8.2.
Propagation			-	AWGN	AWGN	

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.

Note 2:	SS-RSRP, Es/lot and lo levels have been derived from other parameters for information purpose. They are not
	settable parameters.
Note 3:	Void
Note 4:	The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to
	the UE under test is required.

#### A.6.3.2.2.2.2 Test Requirements

Non-Contention based random access is triggered by explicitly assigning a random access preamble via dedicated signalling in the downlink. In the test, the non-contention based random access procedure is not initialized for Other SI requested from UE or beam failure recovery.

#### A.6.3.2.2.2.1 SSB-based Random Access Preamble Transmission

In Test-1, to test the UE behavior specified in Clause 6.2.2.2.1 for SSB-based Random Access Preamble transsision, with the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs configured, the System Simulator shall receive the Random Access Preamble which has the Preamble Index associated with the SSB with index 0.

In addition, the System Simulator shall receive the Random Access Preamble on the PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0, and the selected PRACH occasion shall belongs to the PRACH occasions permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.6.3.2.2.2.2 CSI-RS-based Random Access Preamble Transmission

In Test-2, to test the UE behavior specified in Clause 6.2.2.2.2.1 for CSI-RS-based Random Access Preamble transsision, with the contention-free Random Access Resources and the contention-free PRACH occasions associated with CSI-RSs configured, the System Simulator shall receive the Random Access Preamble which has the Preamble Index associated with the CSI-RS configured.

In addition, the System Simulator shall receive the Random Access Preamble on the PRACH occasion which belongs to the PRACH occasions corresponding to the CSI-RS configured, and the selected PRACH occasion shall belongs to the PRACH occasions permitted by the restrictions given by the *ra-OccasionList*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.6.3.2.2.2.3 Random Access Response Reception

To test the UE behavior specified in Clause 6.2.2.2.2 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response *not* corresponding to the transmitted Random Access Preamble.

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

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

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.6.3.2.2.2.4 No Random Access Response Reception

To test the UE behavior specified in clause 6.2.2.2.2.3 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preambles.

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

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

## A.6.3.2.3 SA: RRC Connection Release with Redirection

### A.6.3.2.3.1 Redirection from NR in FR1 to NR in FR1

#### A.6.3.2.3.1.1 Test Purpose and Environment

This test is to verify RRC connection release with redirection from NR to NR requirements specified in clause 6.2.3.2.1.

#### A.6.3.2.3.1.2 Test Parameters

Supported test configurations are shown in table A.6.3.2.3.1.2-1. The time delay is tested by using the parameters in table A.6.3.2.3.1.2-2, and A.6.3.2.3.1.2-3.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. The *RRCRelease* message containing the relevant system information of Cell 2 shall be sent to the UE during period T1 and the start of T2 is the instant when the last TTI containing the RRC message is sent to the UE. Prior to time duration T2, the UE shall not have any timing information of Cell 2. Cell 2 is powered up at the beginning of the T2.

Table A.6.3.2.3.1.2-1: Redirection from NR to NR test configurations

Config	Description
1	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
	Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
	Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3	Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
	Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is o	nly required to be tested in one of the supported test configurations

Table A.6.3.2.3.1.2-2: General test parameters for Redirection from NR to NR test case

Pa	rameter	Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition			Cell 2	
Filter coefficient			0	L3 filtering is not used
Access Barring Information		-	Not Sent	No additional delays in random access procedure.
Time offset betwe	en cells		3 μs	Synchronous cells
T1		S	5	
T2		S	1	

Table A.6.3.2.3.1.2-3: Cell specific test parameters for Redirection from NR to NR test case

Parameter		l lmi4	Ce	II 1	Ce	II 2
		Unit	T1	T2	T1	T2
NR RF Channel Numbe			1 2			2
Duplex mode	Config 1	-	FDD TDD			
•	Config 2,3					
	Config 1	-		Not App		
TDD configuration	Config 2			TDDC	onf.1.1	
	Config 3		TDDConf.2.1			
	Config 1			10: N <sub>RE</sub>	<sub>3,c</sub> = 52	
BW <sub>channel</sub>	Config 2	MHz	10: N <sub>RB,c</sub> = 52			
	Config 3		40: N <sub>RB,c</sub> = 106			
	Config 1	MHz	10: N <sub>RB,c</sub> = 52			
BWP BW	Config 2		10: N <sub>RB,c</sub> = 52			
	Config 3		40: N <sub>RB,c</sub> = 106			
DRx Cycle		ms	Not Applicable			
	Config 1		SR.1.1 FDD			
PDSCH Reference measurement channel	Config 2			SR.1.	1 TDD	
	Config 3			SR2.1	TDD	
CORESET Reference	Config 1			CR.1.	1 FDD	
Channel	Config 2			CR.1.	1 TDD	

OCNG Patterns  SMTC configuratio  PDSCH/PDCCH subcarrier spacing  PUCCH/PUSCH subcarrier spacing	Config 1,2 Config 3 Config 1,2 Config 3	-		·	oattern 1	
PDSCH/PDCCH subcarrier spacing PUCCH/PUSCH	Config 3 Config 1,2	-  -		SMTC	1 ED1	
PDSCH/PDCCH subcarrier spacing PUCCH/PUSCH	Config 3 Config 1,2	 		SMTC.1 FR1		
subcarrier spacing PUCCH/PUSCH	•	I/U-7		SMTC.2 FR1		
subcarrier spacing PUCCH/PUSCH	Config 3			15	kHz	
		- kHz		30	kHz	
	Config 1,2			15	kHz	
sassarrior opaoning	Config 3	kHz		30	kHz	
PRACH configurati	on			FR1 PRACH	configuration 1	
BWP configuration	Initial DL BWP			DLBV	VP.0.1	
	Dedicated DL BWP			DLBV	VP.1.1	
	Initial UL BWP		ULBWP.0.1			
	Dedicated UL BWP		ULBWP.1.1			
EPRE ratio of PDS EPRE ratio of PDS EPRE ratio of OCN	H DMRS to SSS H to PBCH DMRS CH DMRS to SSS CH to PDCCH DMRS CH DMRS to SSS	dB	0			
$N_{oc}^{ m Note2}$		dBm/15kH z	-98			
$N_{oc}^{ m Note2} egin{array}{c} { m Config} \\ { m Config} \end{array}$					98	
		dBm/SCS		-{	95 	
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$		dB	4	4	-infinity	4
$\hat{E}_s/N_{oc}$		dB	4	4	-infinity	4
Io <sup>Note3</sup> Config	1,2	dBm/ 9.36MHz dBm/	-64.59	-64.59	-70.05	-64.59
Config	Config 3		-58.49	-58.49	-63.94	-58.49
Propagation condit Note 1: OCNG s	ion hall be used such that bot		-114- 1		'GN	

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

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

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

### A.6.3.2.3.1.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 960 ms from the beginning of time period T2. The rate of correct RRC connection release redirection to NR observed during repeated tests shall be at least 90%.

NOTE: The redirection delay can be expressed as:

 $T_{connection\_release\_redirect\_NR} = T_{RRC\_procedure\_delay} + T_{identify\_NR} + T_{SI\_NR} + T_{RACH}$ 

where:

T<sub>RRC\_procedure\_delay</sub> = 110 ms and is specified in clause 12 in TS 38.331 [2].

 $T_{identify-NR} = 680$  ms in the test.

 $T_{SI-NR} = 0$  ms is assumed, since the UE is provided with the SI (including MIB and all relevant SIBs) of the target NR cell before the RRC connection is released by the old NR cell.

 $T_{RACH} = 170$  ms in the test.

This gives a total of 960 ms.

#### A.6.3.2.3.2 Redirection from NR in FR1 to E-UTRAN

#### A.6.3.2.3.2.1 Test Purpose and Environment

This test is to verify RRC connection release with redirection from NR to E-UTRAN requirements specified in clause 6.2.3.2.2.

### A.6.3.2.3.2.2 Test Parameters

Supported test configurations are shown in table A.6.3.2.3.2.2-1. The time delay is tested by using the parameters in table A.6.3.2.3.2.2-2, A.6.3.2.3.2.2-3 and A.6.3.2.3.2.2-4.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. The *RRCRelease* message containing the relevant system information of Cell 2 shall be sent to the UE during period T1 and the start of T2 is the instant when the last TTI containing the RRC message is sent to the UE. Prior to time duration T2, the UE shall not have any timing information of Cell 2. Cell 2 is powered up at the beginning of the T2.

Table A.6.3.2.3.2.2-1: Redirection from NR to E-UTRAN test configurations

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

Table A.6.3.2.3.2.2-2: General test parameters for Redirection from NR to E-UTRAN test case

Pa	rameter	Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
Filter coefficient			0	L3 filtering is not used
Access Barring Information		-	Not Sent	No additional delays in random access procedure.
Time offset between cells			3 μs	Synchronous cells
T1		S	5	
T2	<u>-</u>	s	1	

Table A.6.3.2.3.2.2-3: Cell specific test parameters for Redirection from NR to E-UTRAN (cell 1)

Parameter	Unit	Cell 1		
Farameter		T1	T2	
RF Channel Number		1		

Duplex mode	Duplex mode Config 1		FDD		
Bapiex mode	Config 2,3		TDD		
	Config 1		Not Applicable		
TDD configuration	Config 2		TDDConf.1.1		
	Config 3		TDDConf.2.1		
	Config 1		10: N <sub>RB,c</sub> = 52		
BW <sub>channel</sub>	Config 2	MHz	10: N <sub>RB,c</sub> = 52		
	Config 3		40: N <sub>RB,c</sub> = 106		
	Config 1	MHz	10: N <sub>RB,c</sub> = 52		
BWP BW	Config 2		10: N <sub>RB,c</sub> = 52		
	Config 3		$40: N_{RB,c} = 106$		
DRx Cycle		ms	Not Applicable		
	Config 1		SR.1.1 FDD		
PDSCH Reference measurement channel	Config 2		SR.1.1 TDD		
	Config 3		SR2.1 TDD		
	Config 1		CR.1.1 FDD		
CORESET Reference Channel	Config 2		CR.1.1 TDD		
	Config 3		CR2.1 TDD		
OCNG Patterns	•		OCNG pattern 1		
SMTC configuration	Config 1,2		SMTC.1 FR1		
Sivi 10 corniguration	Config 3		SMTC.2 FR1		
PDSCH/PDCCH	Config 1,2	kHz	15 kHz		
subcarrier spacing	Config 3	KIIZ	30 kHz		
PUCCH/PUSCH	Config 1,2	kHz	15 kHz		
subcarrier spacing	Config 3	KIIZ	30 kHz		
PRACH configuration			FR1 PRACH configuration 1		
BWP configuraiton	Initial DL BWP		DLBWP.0.1		
	Dedicated DL		DLBWP.1.1		
	BWP Initial UL BWP		ULBWP.0.1		
Dedicated UL			ULBWP.1.1		
BWP EPRE ratio of PSS to SSS					
EPRE ratio of PBCH DMRS to SSS  EPRE ratio of PBCH to PBCH DMRS  EPRE ratio of PDCCH DMRS to SSS  EPRE ratio of PDCCH to PDCCH DMRS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH to PDSCH  EPRE ratio of OCNG DMRS to SSS(Note 1)  EPRE ratio of OCNG to OCNG DMRS (Note 1)		dB	0		
$N_{oc}^{Note2}$		dBm/15kH	-98		
**		Z			

λ/ Note2	Config 1,2		-9	98	
IV <sub>oc</sub>	$N_{oc}$ Config 3		-95		
$\hat{E}_{s}/I_{ot}$		dB	4	4	
$\hat{E}_s/N_{oc}$	$\hat{E}_s/N_{oc}$		4	4	
Io <sup>Note3</sup>	Config 1,2	dBm/ 9.36MHz	-64.59	-64.59	
10	Config 3	dBm/ 38.16MHz	-58.49	-58.49	
Propagation condition		-	AWGN		

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

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

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

Table A.6.3.2.3.2.2-4: Cell specific test parameters for Redirection from NR to E-UTRAN (cell 2)

Parameter	Unit	Configuration	Cell 2
			T1 T2
RF channel number		1, 2, 3, 4, 5, 6	2
Duplex mode		1, 2, 3	FDD
		4, 5, 6	TDD
TDD special subframe configuration <sup>Note1</sup>		4, 5, 6	6
TDD uplink-downlink configuration <sup>Note1</sup>		4, 5, 6	1
BW <sub>channel</sub>	MHz	1, 2, 3, 4, 5, 6	5 MHz: N <sub>RB,c</sub> = 25
			10 MHz: $N_{RB,c} = 50$
			20 MHz: N <sub>RB,c</sub> = 100
PRACH Configuration <sup>Note2</sup>		1, 2, 3	4
		4, 5, 6	53
PDSCH parameters:		1, 2, 3	5 MHz: R.7 FDD
DL Reference Measurement			10 MHz: R.3 FDD
Channel <sup>Note3</sup>			20 MHz: R.6 FDD
		4, 5, 6	5 MHz: R.4 TDD
			10 MHz: R.0 TDD
			20 MHz: R.3 TDD
PCFICH/PDCCH/PHICH		1, 2, 3	5 MHz: R.11 FDD
parameters:			10 MHz: R.6 FDD
DL Reference Measurement			20 MHz: R.10 FDD
Channel <sup>Note3</sup>		4, 5, 6	5 MHz: R.11 TDD
			10 MHz: R.6 TDD
OON O D 11 Note2		4.0.0	20 MHz: R.10 TDD
OCNG Patterns <sup>Note3</sup>		1, 2, 3	5 MHz: OP.20 FDD
			10 MHz: OP.10 FDD
		4.5.0	20 MHz: OP.17 FDD
		4, 5, 6	5 MHz: OP.9 TDD
			10 MHz: OP.1 TDD 20 MHz: OP.7 TDD
PBCH RA		1, 2, 3, 4, 5, 6	20 WILLS. OF .7 TOD
PBCH RB		1, 2, 3, 4, 3, 0	
PSS RA			
SSS RA	dB		0
PCFICH RB			
PHICH RA			
PRICE_KA			

PHICH_RB				
PDCCH_RA				
PDCCH_RB				
PDSCH_RA				
PDSCH_RB				
OCNG_RA <sup>Note4</sup>				
OCNG_RB <sup>Note4</sup>				
N <sub>oc</sub> Note5	dBm/15kHz	1, 2, 3, 4, 5, 6	-9	8
Ês/Noc	dB	1, 2, 3, 4, 5, 6	-Infinity	4
Ê <sub>s</sub> /I <sub>ot</sub> Note6	dB	1, 2, 3, 4, 5, 6	-Infinity	4
RSRP <sup>Note6</sup>	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-94
SCH_RP <sup>Note6</sup>	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-94
Io <sup>Note6</sup>	dBm/9MHz	1, 2, 3, 4, 5, 6	-70.22	-64.76
Propagation Condition		1, 2, 3, 4, 5, 6	AW	GN

- Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].
- Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211 [23].
- Note 3: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.
- Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N<sub>oc</sub> to be fulfilled.
- Note 6: Ê<sub>s</sub>/l<sub>ot</sub>, RSRP, SCH\_RP and lo levels have been derived from other parameters for information purposes.
  - They are not settable parameters themselves.
- Note 7: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25].

### A.6.3.2.3.2.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 925 ms from the beginning of time period T2. The rate of correct RRC connection release redirection to E-UTRAN observed during repeated tests shall be at least 90%.

NOTE: The redirection delay can be expressed as:

 $T_{connection \ release \ redirect \ E-UTRA} = T_{RRC \ procedure \ delay} + T_{identify-E-UTRA} + T_{SI-E-UTRA} + T_{RACH}$ 

where:

 $T_{RRC\_procedure\_delay} = 110$  ms and is specified in clause 12 in TS 38.331 [2].

 $T_{identify-E-UTRA} = 800$  ms in the test.

 $T_{SI-NR} = 0$  ms is assumed, since the UE is provided with the SI (including MIB and all relevant SIBs) of the target E-UTRAN cell before the RRC connection is released by the old NR cell.

 $T_{RACH} = 15$  ms in the test.

This gives a total of 925 ms.

# A.6.4 Timing

# A.6.4.1 UE transmit timing

# A.6.4.1.1 NR UE Transmit Timing Test for FR1

## A.6.4.1.1.1 Test Purpose and environment

The purpose of this test is to verify that the UE can follow frame timing change of the connected gNodeb and that the UE initial transmit timing accuracy, maximum amount of timing change in one adjustment, minimum and maximum adjustment rate are within the specified limits. This test will verify the requirements in clause 7.1.2.

Supported test configurations are shown in Table 6.4.1.1.1-1

Table A.6.4.1.1.1-1: Supported test configurations for FR1 PCell

Configuration Description			
1	NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz		
2	NR TDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz		
3	NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz		
Note: The UE is only required to be tested in one of the supported test configurations			

For this test a single NR cell is used. Table A.6.4.1.1.1-2 defines the parameters to be configured and strength of the transmitted signals. The transmit timing is verified by the UE transmitting SRS using the configuration defined in Table A.6.4.1.1.1-3.

Table A.6.4.1.1.1-2: Cell Specific Test Parameters for UL Transmit Timing test

Parameter	Unit	Config	Test1	Test2
SSB ARFCN		1,2,3	1	1
		1	Not Ap	olicable
TDD configuration		2	TDDC	onf.1.1
		3	TDDC	onf.1.2
		1	10: N <sub>R</sub>	<sub>3,c</sub> = 52
BW <sub>channel</sub>	MHz	2	10: N <sub>R</sub>	<sub>3,c</sub> = 52
		3		<sub>,c</sub> = 106
Initial BWP Configuration		1,2,3	DLBV ULBV	
Dedicated BWP Configuration		1,2,3	DLBV ULBV	
DRx Cycle	ms	1,2,3	N/A	DRX.5 <sup>Note5</sup>
PDSCH Reference		1	SR.1.	1 FDD
measurement channel		2		1 TDD
		3	SR.2.	1 TDD
RMSI CORESET		1	CR.1.	1 FDD
Reference Channel		2	CR.1.1 TDD	
		3	CR.2.	1 TDD
Dedicated CORESET		1	CCR.1	.1 FDD
Reference Channel		2		.1 TDD
		3		.1 TDD
OCNG Patterns		1,2,3		P.1
SSB configuration		1,2	SSB.	
0		3	SSB.	
SMTC Configuration		1		ГС.1
om o oomigaradion		3	SM	TC.2
		1	TRS.1	1 FDD
TRS configuration		2	TRS.1	1 TDD
		3	TRS.1	2 TDD
EPRE ratio of PSS to SSS				
EPRE ratio of PBCH DMRS to SSS	dB	1,2,3	0	0
EPRE ratio of PBCH to PBCH DMRS				

(	I		I	1
EPRE ratio of PDCCH				
DMRS to SSS				
EPRE ratio of PDCCH to				
PDCCH DMRS				
EPRE ratio of PDSCH				
DMRS to SSS				
EPRE ratio of PDSCH to				
PDSCH				
EPRE ratio of OCNG				
DMRS to SSS(Note 1)				
EPRE ratio of OCNG to				
OCNG DMRS (Note 1)				
$N_{oc}^{Note2}$	dBm/15 kHz	1,2,3	-98	-98
$N_{oc}^{ m Note2}$	15 10 00	1,2	-98	-98
- ' 00	dBm/SCS	3	-95	-95
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$		1,2,3	3	3
$\hat{E}_s/N_{oc}$		1,2,3	3	3
SS-RSRP <sup>Note3</sup>	-ID/000	1,2	-95	-95
	dBm/SCS	3	-92	-92
Io <sup>Note3</sup>	dBm/9.36MHz	1,2	-65.2	-65.2
	dBm/38.1MHz	3	-59.2	-59.2
Propagation condition		1,2,3	AW	• · ·
SRS Config		1,2	SRSConf.1Note6	SRSConf.3 <sup>Note6</sup>
		3	SRSConf.1 <sup>Note6</sup>	SRSConf.2 <sup>Note6</sup>

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.
- Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 5: DRx related parameters are given in Table A.3.3.5-1
- Note 6: SRS configs are given in Table A.6.4.1.1.1-3

Table A.6.4.1.1.1-3: SRS Configuration for Timing Accuracy Test

	Field	SRSConf.1	SRSConf.2	SRSConf.3	Comments
SRS-	srs-ResourceSetId	0	0	0	
ResourceSet	srs-ResourceldList	0	0	0	
	resourceType	Periodic	Periodic	Periodic	
	Usage	Codebook	Codebook	Codebook	
SRS-	SRS-Resourceld	0	0	0	
Resource	nrofSRS-Ports	Port1	Port1	Port1	
	transmissionComb	n2	n2	n2	
	combOffset-n2	0	0	0	
	cyclicShift-n2	0	0	0	
	resourceMapping startPosition	0	0	0	
	resourceMapping nrofSymbols	n1	n1	n1	
	resourceMapping repetitionFactor	n1	n1	n1	
	freqDomainPosition	0	0	0	
	freqDomainShift	0	0	0	
	freqHopping c-SRS	14 for test configuration 1,2 25 for test configuration 3	25	14	Matches N <sub>RB,c</sub>
	freqHopping b-SRS	0	0	0	
	freqHopping b-hop	0	0	0	
	groupOrSequenceHopping	Neither	Neither	Neither	
	resourceType	Periodic	Periodic	Periodic	
	periodicityAndOffset-p	sl1, 0	sl640, 0	sl320, 0	Offset to align with DRx periodicity
	sequenceld	0	0	0	Any 10 bit number

#### Table A.6.4.1.1.1-4: Void

## A.6.4.1.1.2 Test requirements

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

Following will be the test sequence for this test

- 1) Setup NR PCell according to parameters given in Table A.6.4.1.1.1-1.
- 2) After connection set up with the cell, the test equipment will verify that the timing of the NR cell is within  $(N_{TA} + N_{TA \text{ offset}}) \times T_c \pm T_e$  of the first detected path of DL SSB.
  - a. The  $N_{TA}$  offset value (in  $T_c$  units) is 25600
  - b. The  $T_e$  values depend on the DL and UL SCS for which the test is being run and are given in Table 7.1.2- 1
- 3) The test system shall adjust the timing of the DL path by values given in Table A.6.4.1.1.2-1

Table A.6.4.1.1.2-1: Adjustment Value for DL Timing

SCS of SSB signals (KHz)	Adjustment Value	
	Test1	Test2
15	+64*64T <sub>c</sub>	+32*64T <sub>c</sub>
30	+32*64T <sub>c</sub>	+16*64T <sub>c</sub>

- 4) The test system shall verify that the adjustment step size and the adjustment rate shall be according to requirements specified in clause 7.1.2 Table 7.1.2-3 until the UE transmit timing offset is within ( $N_{TA} + N_{TA\_offset}$ ) ×T<sub>c</sub>  $\pm$  T<sub>e</sub> respective to the first detected path (in time) of DL SSB. Skip this step for test 2 with DRX configured.
- 5) The test system shall verify that the UE transmit timing offset stays within  $(N_{TA} + N_{TA\_offset}) \times T_c \pm T_e$  of the first detected path of DL SSB. For Test 2 the UE transmit timing offset shall be verified for the first transmission in the DRX cycle immediately after DL timing adjustment

# A.6.4.2 UE timer accuracy

# A.6.4.3 Timing advance

# A.6.4.3.1 SA FR1 timing advance adjustment accuracy

# A.6.4.3.1.1 Test Purpose and Environment

The purpose of the test is to verify UE Timing Advance adjustment delay and accuracy requirement defined in clause 7.3.

#### A.6.4.3.1.2 Test Parameters

Supported test configurations are shown in table A.6.4.3.1.2-1. Both timing advance adjustment delay and accuracy are tested by using the parameters in table A.6.4.3.1.2-2, A.6.4.3.1.2-3 and A.6.4.3.1.2-4.

In all test cases, single cell is used. Each test consists of two successive time periods, with time duration of T1 and T2 respectively. In each time period, timing advance commands are sent to the UE and Sounding Reference Signals (SRS), as specified in table A.6.4.3.1.2-3, are sent from the UE and received by the test equipment. By measuring the reception of the SRS, the transmit timing, and hence the timing advance adjustment accuracy, can be.

During time period T1, the test equipment shall send one message with a Timing Advance Command MAC Control Element, as specified in Clause 6.1.3.4 in TS 38.321 [7]. The Timing Advance Command value shall be set to 31, which according to Clause 4.2 in TS 38.213 [3] results in zero adjustment of the Timing Advance. In this way, a reference value for the timing advance used by the UE is established.

During time period T2, the test equipment shall send a sequence of messages with Timing Advance Command MAC Control Elements, with Timing Advance Command value specified in table A.6.4.3.1.2-2. This value shall result in changes of the timing advance used by the UE, and the accuracy of the change shall then be measured, using the SRS sent from the UE.

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

The UE Time Alignment Timer, described in Clause 5.2 in TS 38.321 [7], shall be configured so that it does not expire in the duration of the test.

Table A.6.4.3.1.2-1: Timing advance supported test configurations

	Config	Description		
1		NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode		
2		NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode		
3		NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode		
Note:	The UE is only re	ly required to be tested in one of the supported test configurations		

Table A.6.4.3.1.2-2: General test parameters for timing advance

Parameter	Unit	Value	Comment
RF channel number		1	
Initial DL BWP		DLBWP.0.1	As specified in Table A.3.9.2.1-1
Dedicated DL BWP		DLBWP.1.1	As specified in Table A.3.9.2.2-1
Initial UL BWP		ULBWP.0.1	As specified in Table A.3.9.3.1-1
Dedicated UL BWP		ULBWP.1.1	As specified in Table A.3.9.3.2-1
Timing Advance Command $(T_A)$ value during T1		31	N <sub>TA_new</sub> = N <sub>TA_old</sub> for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2
Timing Advance Command (T <sub>A</sub> ) value during T2		39	For 15 kHz SCS $N_{TA\_new} = N_{TA\_old} + 8192*T_c$ For 30 kHz SCS $N_{TA\_new} = N_{TA\_old} + 4096*T_c$ (based on equation in clause 4.2 of TS 38.213 [3])
T1	s	5	
T2	S	5	

Table A.6.4.3.1.2-3: Cell specific test parameters for timing advance

Parameter		Unit	Test1	
Par			T1	T2
Dunlay mada	Config 1		FDD	
Duplex mode	Config 2,3		TDD	
	Config 1		Not Applic	able
TDD configuration	Config 2		TDDConf	.1.1
	Config 3		TDDConf	.2.1
	Config 1		10: N <sub>RB,c</sub> :	= 52
BW <sub>channel</sub>	Config 2	MHz	10: N <sub>RB,c</sub> :	= 52
	Config 3		40: N <sub>RB,c</sub> =	: 106
	Config 1		10: N <sub>RB,c</sub> :	= 52
BWP BW	Config 2	MHz	10: N <sub>RB,c</sub> = 52	
	Config 3		40: N <sub>RB,c</sub> =	= 106
DRx Cycle		ms	Not Applicable	
PDSCH Reference	Config 1		SR.1.1 F	DD
measurement	Config 2		SR.1.1 T	DD
channel	Config 3		SR2.1 TI	DD
CORESET	Config 1		CR.1.1 F	DD
Reference Channel	Config 2		CR.1.1 T	DD
Reference Charmer	Config 3		CR2.1 TI	DD
	Config 1,4		TRS.1.1 F	-DD
TRS configuration	Config 2,5		TRS.1.1 <sup>-</sup>	ΓDD
	Config 3,6		TRS.1.2	rdd
OCNG Patterns			OCNG pat	
SMTC	Config 1,2		SMTC.1 I	FR1
configuration	Config 3		SMTC.2 I	FR1
	Config 1,2	kHz	15 kH:	Z

PDSCH/PDCCH Config 3		30 kHz	
subcarrier spacing		JU KI IZ	
PUCCH/PUSCH Config 1,2	kHz	15 kHz	
subcarrier spacing Config 3	KIIZ	30 kHz	
EPRE ratio of PSS to SSS			
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS	dB	0	
EPRE ratio of PDSCH DMRS to SSS	ub_	Ů	
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS(Note 1)			
EPRE ratio of OCNG to OCNG DMRS (Note			
1)			
$N_{oc}^{$	dBm/15kH	-98	
· ·	Z		
Note2 Config 1,2	dBm/SCS	-98	
Corning 5	42, 555	-95	
${ m \hat{E}}_{ m s}/{ m I}_{ m ot}$	dB	3	
$\hat{E}_s/N_{oc}$	dB	3	
Config 1,2	dBm/ 9.36MHz	-67.57	
Io <sup>Note3</sup>	dBm/		
Config 3	38.16MHz	-62.58	
Propagation condition	-	AWGN	

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

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

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

Table A.6.4.3.1.2-4: Sounding Reference Symbol Configuration for timing advance

Field		Value	Comment
c-SRS	Config 1,2	12	
U-5K5	Config 3	24	Fraguency hopping is disabled
b-S	RS	0	Frequency hopping is disabled
b-h	пор	0	
freqDoma	inPosition	0	Frequency domain position of SRS
freqDon	nainShift	0	
groupOrSequ	enceHopping	neither	No group or sequence hopping
SRS-Periodi	SRS-PeriodicityAndOffset		Once every 5 slots
pathlossRe	pathlossReferenceRS		SSB #0 is used for SRS path loss estimation
usa	usage		Codebook based UL transmission
startP	osition	0	resourceMapping setting. SRS on last
nrofSy	mbols	n1	symbol of slot, and 1symbols for SRS
repetition	nFactor	n1	without repetition.
combO	combOffset-n2		transmission Comb patting
cyclicShift-n2		0	transmissionComb setting
nrofSRS-Ports		port1	Number of antenna ports used for SRS transmission
Note: For further	er information see cla	use 6.3.2 in TS 38	.331 [2].

# A.6.4.3.1.3 Test Requirements

The UE shall apply the signalled Timing Advance value to the transmission timing at the designated activation time i.e. k+1 slots after the reception of the timing advance command, where k=5.

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

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

# A.6.5 Signalling characteristics

# A.6.5.1 Radio link Monitoring

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

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

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

- UE output power higher than Transmit OFF power -50 dBm (as defined in TS 38.101-1 [18]) means uplink signal
- UE output power equal to or less than Transmit OFF power -50 dBm (as defined in TS 38.101-1 [18]) means no uplink signal.

# A.6.5.1.1 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with SSB-based RLM RS in non-DRX mode

#### A.6.5.1.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell. This test will partly verify the FR1 radio link monitoring requirements in clause 8.1.

Supported test configurations are shown in table A.6.5.1.1.1-1. The test parameters are given in Tables A.6.5.1.1.1-2, A.6.5.1.1.1-3, and A.6.5.1.1.1-4 below. There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.6.5.1.1.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. The UE is configured to perform inter-frequency measurements using Gap Pattern ID #0 (40ms) in test 1.

Table A.6.5.1.1.1-1: Supported test configurations for FR1 PCell

Configuration Description			
1	FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz		
2	TDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz		
3	TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz		
	is only required to pass in one of the supported test rations in FR1		

Table A.6.5.1.1.1-2: General test parameters for FR1 out-of-sync testing in non-DRX mode

Parameter		Unit	Value		
			Test 1		
Active PCell			Cell 1		
	RF Channel Number			1	
Duplex mode		Config 1		FDD	
,		Config 2, 3		TDD	
BW <sub>channel</sub>		Config 1	MHz	10: N <sub>RB,c</sub> = 52	
		Config 2		10: N <sub>RB,c</sub> = 52	
		Config 3		40: N <sub>RB,c</sub> = 106	
DL initial BWP configuration		Config 1, 2, 3		DLBWP.0.1	
DL dedicated B configuration	WP	Config 1, 2, 3		DLBWP.1.1	
UL initial BWP configuration		Config 1, 2, 3		ULBWP.0.1	
UL dedicated B	WP	Config 1, 2, 3		ULBWP.1.1	
configuration TDD Configurat	tion	Config 1		Not Applicable	
Conligurat	lion	Config 1 Config 2		Not Applicable TDDConf.1.1	
				TDDConf.2.1	
CORESET Refe	arence	Config 3 Config 1	-	CR.1.1 FDD	
Channel	erence	Config 2		CR.1.1 TDD	
Charmer		Config 3		CR.2.1 TDD	
SSB Configurat	ion	Config 1		SSB.1 FR1	
33b Cornigurat	.1011	Config 2		SSB.1 FR1	
		Config 3		SSB.2 FR1	
SMTC Configur	ation	Config 1, 2		SMTC.1	
Sivi i C Cornigui	ation				
PDSCH/PDCCI	Louboarrior	Config 3 Config 1, 2		SMTC.1 15 kHz	
spacing	a subcarrier	•			
		Config 3		30 kHz	
PRACH Configu	uration	Config 1, 2		Table A.3.8.2.4-1	
		Config 3		Table A.3.8.2.4-1	
SSB index assi		RS		0	
OCNG paramet	ters			OP.1	
CP length				Normal	
		na Configuration		2x2 Low	
Out of sync	DCI format			1-0	
transmission parameters	Number of 0 symbols	Number of Control OFDM symbols		2	
	Aggregation	level	CCE	8	
		atio of hypothetical PDCCH RE ergy to average SSS RE		4	
	Ratio of hyp	othetical PDCCH gy to average SSS RE	dB	4	
DMRS prec		oder granularity		REG bundle size	
REG bundle size			6		
DRX				OFF	
Gap pattern ID				gp0	
Layer 3 filtering				Enabled	
T310 timer	-		ms	0	
T311 timer			ms	1000	

N310			1
N311			1
CSI-RS configuration for	Config 1		CSI-RS.1.1 FDD
CSI reporting	Config 2		CSI-RS.1.1 TDD
	Config 3		CSI-RS.2.1 TDD
CSI-RS for tracking	Config 1		TRS.1.1 FDD
	Config 2		TRS.1.1 TDD
	Config 3		TRS.1.2 TDD
T1		S	0.2
T2		S	0.48
T3		S	0.48
D1		S	0.44

Note 1: All configurations are assigned to the UE prior to the start of time period T1.

Note 2: UE-specific PDCCH is not transmitted after T1 starts.

Table A.6.5.1.1.1-3: Cell specific test parameters for FR1 (Cell 1) for out-of-sync radio link monitoring tests in non-DRX mode

Parameter		Unit		Test 1	
			T1	T2	T3
EPRE ratio of PDC	EPRE ratio of PDCCH DMRS to SSS			4	
EPRE ratio of PDC	CCH to PDCCH DMRS	dB		0	
EPRE ratio of PBC	CH DMRS to SSS	dB			
EPRE ratio of PBC	CH to PBCH DMRS	dB			
EPRE ratio of PSS	S to SSS	dB			
EPRE ratio of PDS	SCH DMRS to SSS	dB		0	
EPRE ratio of PDS	SCH to PDSCH DMRS	dB			
EPRE ratio of OCI	NG DMRS to SSS	dB			
EPRE ratio of OCI	NG to OCNG DMRS	dB			
SNR on RLM-RS	Config 1	dB	1	-7	-15
	Config 2		1	-7	-15
	Config 3		1	-7	-15
SNR on other channels and signals	Config 1, 2, 3	dB	1		
$N_{oc}$	Λ/ Config 1			-98	
1 V oc	Config 2	15kH		-98	
	Config 3	Z		-98	
$N_{oc}$	Config 1	dBm/		-98	
1 V oc	Config 2	SCS		-98	
	Config 3			-95	
Propagation condi-	tion		TDL	-C 300ns 1	00Hz

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.

Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.

Note 4: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in Figure A.6.5.1.1.1-1.

Note 5: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6.

Table A.6.5.1.1.1-4: Measurement gap configuration for out-of-sync tests in non-DRX mode

Field		Test 1
		Value
gap	Offset	0
Note:	Ensure that measurem	at RLM RS is partially overlapped with nent gap

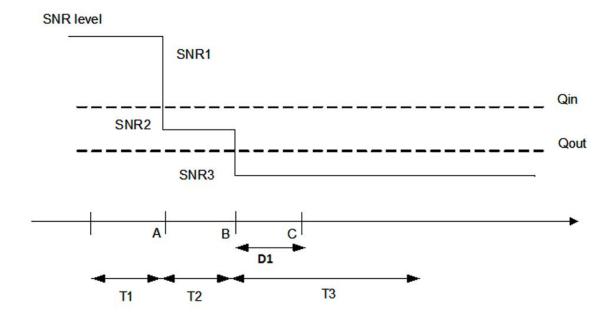


Figure A.6.5.1.1.1-1: SNR variation for out-of-sync testing

## A.6.5.1.1.2 Test Requirements

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

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

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

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

# A.6.5.1.2 Radio Link Monitoring In-sync Test for FR1 PCell configured with SSB-based RLM RS in non-DRX mode

# A.6.5.1.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell. This test will partly verify the FR1 radio link monitoring requirements in clause 8.1.

Supported test configurations are shown in table A.6.5.1.2.1-1. The test parameters are given in Tables A.6.5.1.2.1-2, and A.6.5.1.2.1-3 below. There is one cell (Cell 1), which is the active cell, in the test. The test consists of five

successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.6.5.1.2.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms.

Table A.6.5.1.2.1-1: Supported test configurations for FR1 PCell

Configuration	Description		
1	FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz		
2	TDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz		
3	TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz		
Note: The UE is only required to pass in one of the supported test configurations in FR1			

Table A.6.5.1.2.1-2: General test parameters for FR1 in-sync testing in non-DRX mode

Parameter		Unit	Value	
			Test 1	
Active PCell			Cell 1	
RF Channel Number			1	
Duplex mode	Config 1		FDD	
	Config 2, 3		TDD	
BW <sub>channel</sub>	Config 1	MHz	10: N <sub>RB,c</sub> = 52	
	Config 2		10: N <sub>RB,c</sub> = 52	
	Config 3		40: N <sub>RB,c</sub> = 106	
DL initial BWP configuration	Config 1, 2, 3		DLBWP.0.1	
DL dedicated BWP configuration	Config 1, 2, 3		DLBWP.1.1	
UL initial BWP configuration	Config 1, 2, 3		ULBWP.0.1	
UL dedicated BWP configuration	Config 1, 2, 3		ULBWP.1.1	
TDD Configuration	Config 1		Not Applicable	
	Config 2		TDDConf.1.1	
	Config 3		TDDConf.2.1	
CORESET Reference	Config 1		CR.1.1 FDD	
Channel	Config 2		CR.1.1 TDD	
	Config 3		CR.2.1 TDD	
SSB Configuration	Config 1		SSB.1 FR1	
	Config 2		SSB.1 FR1	
	Config 3		SSB.2 FR1	
SMTC Configuration	Config 1, 2		SMTC.1	
	Config 3		SMTC.1	
PDSCH/PDCCH	Config 1, 2		15 kHz	
subcarrier spacing	Config 3		30 kHz	
PRACH Configuration	Config 1, 2		Table A.3.8.2.4-1	
	Config 3		Table A.3.8.2.4-1	
SSB index assigned as F	RLM RS		0	
OCNG parameters			OP.1	
CP length			Normal	
Correlation Matrix and Ar	ntenna Configuration		2x2 Low	
	OCI format		1-0	

	N I CO I LOEDM	1	•
In sync transmission	Number of Control OFDM		2
parameters	symbols		
	Aggregation level	CCE	4
	Ratio of hypothetical	dB	0
	PDCCH RE energy to		
	average SSS RE energy		
	avorage coetic energy		
	Ratio of hypothetical	dB	0
		uБ	U
	PDCCH DMRS energy to		
	average SSS RE energy		
			BEO.1
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
Out of owns	DCI format		1-0
Out of sync			2
transmission	Number of Control OFDM		2
parameters	symbols		
	Aggregation level	CCE	8
	Ratio of hypothetical	dB	4
	PDCCH RE energy to		
	average SSS RE energy		
	Ratio of hypothetical	dB	4
	PDCCH DMRS energy to		
	average SSS RE energy		
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			OFF
Gap pattern ID			N.A.
Layer 3 filtering			Enabled
			Enablea
T310 timer		ms	1000
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration	Config 1		CSI-RS.1.1 FDD
for CSI reporting	Config 2		CSI-RS.1.1 TDD
	Config 3		CSI-RS.2.1 TDD
CSI-RS for tracking	Config 1, 4		TRS.1.1 FDD
2 2 2	Config 2, 5		TRS.1.1 TDD
	Config 3, 6		TRS.1.2 TDD
T1	1 Coming 0, 0	S	0.2
T2		S	0.2
T3		S	0.24
T4		S	0.2
T5		S	0.88
D1		1	0.84
וטו		S	U.0 <del>4</del>

All configurations are assigned to the UE prior to the start of time period T1. UE-specific PDCCH is not transmitted after T1 starts. Note 1:

Note 2:

Table A.6.5.1.2.1-3: Cell specific test parameters for FR1 (Cell 1) for in-sync radio link monitoring tests in non-DRX mode

Parameter		Unit			Test 1		
			T1	T2	Т3	T4	T5
EPRE ratio of PDC	CH DMRS to SSS	dB			4		
EPRE ratio of PDC	CH to PDCCH DMRS	dB			0		
EPRE ratio of PBCI	H DMRS to SSS	dB					
EPRE ratio of PBCI	H to PBCH DMRS	dB					
EPRE ratio of PSS	to SSS	dB					
EPRE ratio of PDS0	CH DMRS to SSS	dB			0		
EPRE ratio of PDS0	CH to PDSCH DMRS	dB					
EPRE ratio of OCN	G DMRS to SSS	dB					
EPRE ratio of OCN	G to OCNG DMRS	dB					
SNR on RLM-RS	Config 1	dB	1	-7	-15	-4.5	1
	Config 2		1	-7	-15	-4.5	1
	Config 3		1	-7	-15	-4.5	1
SNR on other channels and signals	Config 1, 2, 3	dB	1				
M	Config 1	dBm/			-98		
$N_{oc}$	Config 2	15			-98		
	Config 3	kHz			-98		
$N_{oc}$	Config 1	dBm/			-98		
<sup>1</sup> V oc	Config 2	SCS			-98		
	Config 3				-95		
Propagation condition	on			TDL-C	300ns	100Hz	

- Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
- Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
- Note 4: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in Figure A.6.5.1.2.1-1.
- Note 5: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 and T4 is modified as specified in clause A.3.6.

## SNR level SNR1 SNR5 Qin SNR2 SNR4 SNR3 Α В С D Ε D1 T1 T3 T4 T5 T2

#### Table A.6.5.1.2.1-4: Void

Figure A.6.5.1.2.1-1: SNR variation for in-sync testing

### A.6.5.1.2.2 Test Requirements

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

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

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

# A.6.5.1.3 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with SSB-based RLM RS in DRX mode

### A.6.5.1.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell when DRX is used. This test will partly verify the FR1 radio link monitoring requirements in clause 8.1.

Supported test configurations are shown in table A.6.5.1.3.1-1. The test parameters are given in Tables A.6.5.1.3.1-2, and A.6.5.1.3.1-3. There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.6.5.1.3.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test. The UE is configured to perform inter-frequency measurements using Gap Pattern ID #0 (40ms) in test 2.

Table A.6.5.1.3.1-1: Supported test configurations for FR1 PCell

Configuration	Description		
1	FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz		
2	TDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz		
3	TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz		
	The UE is only required to pass in one of the supported test configurations in FR1		

Table A.6.5.1.3.1-2: General test parameters for FR1 out-of-sync testing in DRX mode

Parameter		Unit	Value
			Test 1
Active PCell			Cell 1
RF Channel Number			1
Duplex mode	Config 1		FDD
	Config 2, 3		TDD
BW <sub>channel</sub>	Config 1	MHz	10: N <sub>RB,c</sub> = 52
	Config 2		10: N <sub>RB,c</sub> = 52
	Config 3		40: N <sub>RB,c</sub> = 106
DL initial BWP configuration	Config 1, 2, 3		DLBWP.0.1
DL dedicated BWP configuration	Config 1, 2, 3		DLBWP.1.1
UL initial BWP configuration	Config 1, 2, 3		ULBWP.0.1
UL dedicated BWP configuration	Config 1, 2, 3		ULBWP.1.1
TDD Configuration	Config 1		Not Applicable
	Config 2		TDDConf.1.1
	Config 3		TDDConf.2.1
CORESET Reference	Config 1		CR.1.1 FDD
Channel	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
SSB Configuration	Config 1		SSB.1 FR1
	Config 2		SSB.1 FR1
	Config 3		SSB.2 FR1
SMTC Configuration	Config 1, 2		SMTC.1
	Config 3		SMTC.1
PDSCH/PDCCH	Config 1, 2		15 kHz
subcarrier spacing	Config 3		30 kHz
PRACH Configuration	Config 1, 2		Table A.3.8.2.4-1
	Config 3		Table A.3.8.2.4-1
	SSB index assigned as RLM RS		0
OCNG parameters			OP.1
	CP length		Normal
	Correlation Matrix and Antenna Configuration		2x2 Low
Out of sync	DCI format		1-0
transmission parameters	Number of Control OFDM symbols		2
	Aggregation level	CCE	8

	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX Configuration			DRX.3
Gap pattern ID			N.A.
Layer 3 filtering			Enabled
T310 timer		ms	0
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration	Config 1		CSI-RS.1.1 FDD
for CSI reporting	Config 2		CSI-RS.1.1 TDD
	Config 3		CSI-RS.2.1 TDD
CSI-RS for tracking	Config 1		TRS.1.1 FDD
_	Config 2		TRS.1.1 TDD
	Config 3		TRS.1.2 TDD
T1	T1		0.2
T2		S	0.68
T3		S	0.68
D1		S	0.64

All configurations are assigned to the UE prior to the start of time period T1. UE-specific PDCCH is not transmitted after T1 starts. Note 1:

Note 2:

Table A.6.5.1.3.1-3: Cell specific test parameters for FR1 (Cell 1) for out-of-sync radio link monitoring tests in DRX mode

Pa	Unit	Test 1				
			T1	T2	T3	
EPRE ratio of PDC0	dB	4				
EPRE ratio of PDC0	CH to PDCCH DMRS	dB		0		
EPRE ratio of PBCl	H DMRS to SSS	dB				
EPRE ratio of PBCl	H to PBCH DMRS	dB				
EPRE ratio of PSS	to SSS	dB		0		
EPRE ratio of PDS0	CH DMRS to SSS	dB				
EPRE ratio of PDS0	CH to PDSCH DMRS	dB				
EPRE ratio of OCN	G DMRS to SSS	dB				
EPRE ratio of OCN	G to OCNG DMRS	dB				
SNR on RLM-RS	Config 1	dB	1	-7	-15	
	Config 2		1	-7	-15	
	Config 3		1	-7	-15	
SNR on other						
channels and	Config 1, 2, 3	dB	1			
signals						
$N_{oc}$	Config 1	dBm/15	-98			
Coming 2		kHz	-98			
	Config 3		-98			
$N_{oc}$	Config 1	dBm/S	-98			
Config 2		cs	-98			
	Config 3		-95			
Propagation condition		TDL-C 300ns 100Hz				

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Table A.6.5.1.3.1-4: Void

Table A.6.5.1.3.1-5: Void

Table A.6.5.1.3.1-6: Void

Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.

Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.

Note 4: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in Figure A.6.5.1.3.1-1.

Note 5: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6.

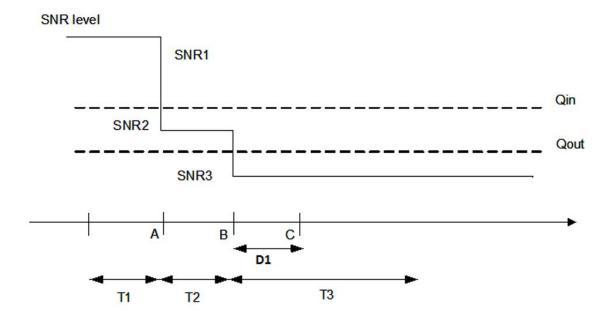


Figure A.6.5.1.3.1-1: SNR variation for out-of-sync testing

## A.6.5.1.3.2 Test Requirements

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

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

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

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

# A.6.5.1.4 Radio Link Monitoring In-sync Test for FR1 PCell configured with SSB-based RLM RS in DRX mode

### A.6.5.1.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell when DRX is used. This test will partly verify the FR1 radio link monitoring requirements in clause 8.1.

Supported test configurations are shown in table A.6.5.1.4.1-1. The test parameters are given in Tables A.6.5.1.4.1-2, and A.6.5.1.4.1-3. There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.6.5.1.4.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when Onduration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

Table A.6.5.1.4.1-1: Supported test configurations for FR1 PCell

Configuration	Description			
1	FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz			
2	TDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz			
3	TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz			
	Note: The UE is only required to pass in one of the supported test configurations in FR1			

Table A.6.5.1.4.1-2: General test parameters for FR1 in-sync testing in DRX mode

Para	ameter	Unit	Value
			Test 1
			<u> </u>
Active PCell			Cell 1
	RF Channel Number		1
Duplex mode	Config 1		FDD
	Config 2, 3		TDD
BW <sub>channel</sub>	Config 1	MHz	10: N <sub>RB,c</sub> = 52
	Config 2		10: N <sub>RB,c</sub> = 52
	Config 3		40: N <sub>RB,c</sub> = 106
DL initial BWP configuration	on Config 1, 2, 3		DLBWP.0.1
DL dedicated BWP	Config 1, 2, 3		DLBWP.1.1
configuration	0.5.4.0.0		
UL initial BWP configuration	on Config 1, 2, 3		ULBWP.0.1
UL dedicated BWP configuration	Config 1, 2, 3		ULBWP.1.1
TDD Configuration	Config 1		Not Applicable
Ü	Config 2		TDDConf.1.1
	Config 3		TDDConf.2.1
CORESET Reference	Config 1		CR.1.1 FDD
Channel	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
SSB Configuration	Config 1		SSB.1 FR1
· ·	Config 2		SSB.1 FR1
	Config 3		SSB.2 FR1
SMTC Configuration	Config 1, 2		SMTC.1
	Config 3		SMTC.1
PDSCH/PDCCH subcarrie	er Config 1, 2		15 kHz
spacing	Config 3		30 kHz
PRACH Configuration	Config 1, 2		Table A.3.8.2.4-1
	Config 3		Table A.3.8.2.4-1
SSB index assigned as RI	_M RS		0
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and Antenna Configuration			2x2 Low
	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	4
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	0

	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	0
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
Out of sync	DCI format		1-0
transmission parameters	Number of Control OFDM symbols		2
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX Configuration			DRX.3
Gap pattern ID			N.A.
Layer 3 filtering			Enabled
T310 timer		ms	2000
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration for	Config 1		CSI-RS.1.1 FDD
CSI reporting	Config 2		CSI-RS.1.1 TDD
	Config 3		CSI-RS.2.1 TDD
CSI-RS for tracking	Config 1		TRS.1.1 FDD
	Config 2		TRS.1.1 TDD
	Config 3		TRS.1.2 TDD
T1		S	0.2
T2		s	0.2
T3		S	0.64
T4		S	0.2
T5	T5		0.88
D1		s	0.84

All configurations are assigned to the UE prior to the start of time period T1. UE-specific PDCCH is not transmitted after T1 starts. Note 1:

Note 2:

Table A.6.5.1.4.1-3: Cell specific test parameters for FR1 (Cell 1) for in-sync radio link monitoring tests in DRX mode

Parameter		Unit	Unit Test 1					
			T1	T2	T3	T4	T5	
EPRE ratio of PDCCH DMRS to SSS		dB	4					
EPRE ratio of PD	CCH to PDCCH DMRS	dB	0					
EPRE ratio of PB	CH DMRS to SSS	dB						
EPRE ratio of PB	CH to PBCH DMRS	dB						
EPRE ratio of PS	S to SSS	dB	0					
EPRE ratio of PD	SCH DMRS to SSS	dB						
EPRE ratio of PD	SCH to PDSCH DMRS	dB						
EPRE ratio of OC	NG DMRS to SSS	dB						
EPRE ratio of OC	NG to OCNG DMRS	dB						
SNR on RLM-RS	Config 1	dB	1	-7	-15	-4.5	1	
	Config 2	7 [	1	-7	-15	-4.5	1	
	Config 3	7 [	1	-7	-15	-4.5	1	
SNR on other								
channels and	Config 1, 2, 3	dB	1					
signals								
$\mathcal{N}$	Config 1	dBm/15	-98					
$N_{oc}$ Config 1		kHz	-98					
	Config 3		-98					
$\mathcal{N}$	Config 1	dBm/S	-98					
$N_{oc}$	Config 2	CS	-98					
	Config 3		-95					
Propagation condition			TDL-C 300ns 100Hz					

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.

Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.

Note 4: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in Figure A.6.5.1.4.1-1.

Note 5: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 and T4 is modified as specified in clause A.3.6.

Table A.6.5.1.4.1-4: Void Table A.6.5.1.4.1-5: Void

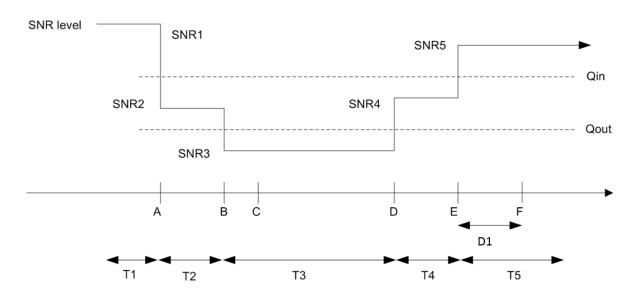


Figure A.6.5.1.4.1-1: SNR variation for in-sync testing.

### A.6.5.1.4.2 Test Requirements

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

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

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

# A.6.5.1.5 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode

### A.6.5.1.5.1 Test Purpose and Environment

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

The test parameters are given in Tables A.6.5.1.5.1-1, A.6.5.1.5.1-2, A.6.5.1.5.1-3, and A.6.5.1.5.1-3A below. There is one cell, cell 1 which is the PCell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.6.5.1.5.1-1 shows the variation of the downlink SNR in the PCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test. In the test, SSB0 is configured as the BFD-RS.

Table A.6.5.1.5.1-1: Supported test configurations for FR1 PCell

Cor	nfiguration	ion Description		
1		FDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth		
2		TDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth		
3		TDD duplex mode, 30 kHz SSB SCS, 40 MHz bandwidth		
Note: The UE is only required to pass in one of the supported test configurations in FR1				

Table A.6.5.1.5.1-2: General test parameters for FR1 PCell for CSI-RS out-of-sync testing in non-DRX mode

	Parameter	Unit	Value
			Test 1
Active PCell			Cell 1
RF Channel Number			1
Duplex mode	Config 1		FDD
TDD Configuration	Config 2, 3		TDD
TDD Configuration	Config 1 Config 2		Not Applicable TDDConf.1.1
	Config 2		TDDConf.2.1
DL initial BWP	Config 3 Config 1, 2, 3		DLBWP.0.1
configuration	Cornig 1, 2, 3		DEBWI .U. I
DL dedicated BWP configuration	Config 1, 2, 3		DLBWP.1.1
UL initial BWP configuration	Config 1, 2, 3		ULBWP.0.1
UL dedicated BWP configuration	Config 1, 2, 3		ULBWP.1.1
CORESET	Config 1		CR.1.1 FDD
Reference Channel	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
SSB Configuration	Config 1		SSB.1 FR1
	Config 2		SSB.1 FR1
	Config 3		SSB.2 FR1
SMTC Configuration	Config 1, 2		SMTC.1
	Config 3		SMTC.1
PDSCH/PDCCH	Config 1, 2		15 kHz
subcarrier spacing	Config 3		30 kHz
TRS configuration	Config 1		TRS.1.1 FDD
	Config 2		TRS.1.1 TDD
	Config 3		TRS.1.2 TDD
CSI-RS for RLM	Config 1		Resource #4 in TRS.1.1 FDD
	Config 2		Resource #4 in TRS.1.1 TDD
	Config 3		Resource #4 in TRS.1.2 TDD
TCI configuration for F	PDCCH/PDSCH		TCI.State.0
OCNG parameters			OP.1
CP length			Normal
	Antenna Configuration		2x2 Low
•	DCI format		1-0
transmission	Number of Control OFDM		2
parameters	symbols	CCE	9
	Aggregation level Ratio of hypothetical PDCCH RE	dB	8 4
	energy to average CSI-RS RE energy	uБ	4
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS	dB	4
	RE energy  DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			OFF
Gap pattern ID			gp0
Layer 3 filtering			Enabled
T310 timer		ms	0
T311 timer		ms	1000
N310			1
N311			1

CSI-RS configuration	Config 1		CSI-RS.1.1 FDD
for CSI reporting	Config 2		CSI-RS.1.1 TDD
	Config 3		CSI-RS.2.1 TDD
T1		S	0.2
T2		S	0.48
T3		S	0.48
D1		S	0.44
Note 1: UE-specific PDCCH is not transmitted after T1 starts.			

Table A.6.5.1.5.1-3: Cell specific test parameters for FR1 for CSI-RS out-of-sync radio link monitoring in non-DRX mode

Parameter			Test 1	
		T1	T2	T3
	dB		4	
S_beta	dB		4	
	dB			
	dB			
	dB		0	
	dB			
OCNG beta				
Config 1	dB	1	-7	-15
Config 2		1	-7	-15
Config 3		1	-7	-15
Config 1	dB		1	
Config 2		1		
			1	
Config 1	dBm/15kHz	-98		
Config 2			-98	
Config 3			-98	
Propagation condition		TDL-C 300ns 100Hz		
	Config 1 Config 2 Config 3 Config 1 Config 2 Config 3 Config 1 Config 2 Config 1 Config 2 Config 3	dB   dB   dB   dB   dB   dB   dB   dB	T1  dB dB dB dB dB dB dB dB dB Config 1 Config 2 Config 3 Config 1 Config 2 Config 3 Config 2 Config 3 Config 3 Config 3 Config 3 Config 3 Config 1 Config 3 Config 3 Config 3 Config 1 Config 2 Config 3 Config 3 Config 1 Config 2 Config 3 Config 1 Config 2 Config 3 Config 1 Config 2 Config 3	T1   T2

- Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
- Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
- Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
- Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
- Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.6.5.1.5.1-1.
- Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is [A.3.6].

Table A.6.5.1.5.1-3A: Measurement gap configuration for FR1 CSI-RS out-of-sync radio link monitoring in non-DRX mode

Field	Test 1
rieid	Value
gapOffset	0
Note 1: Void	

#### Table A.6.5.1.5.1-4: Void

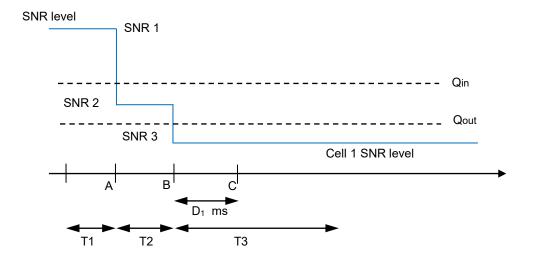


Figure A.6.5.1.5.1-1: SNR variation for CSI-RS out-of-sync testing

#### A.6.5.1.5.2 Test Requirements

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

During time durations T1, T2 and T3, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

The UE shall stop transmitting uplink signal in Cell 1 no later than time point C ( $D_1$  ms after the start of the time duration T3) on the PCell.

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

## A.6.5.1.6 Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode

#### A.6.5.1.6.1 Test Purpose and Environment

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

The test parameters are given in Tables A.6.5.1.6.1-1, A.6.5.1.6.1-2, and A.6.5.1.6.1-3 below. There is one cells, cell 1which is the PCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.6.5.1.6.1-1 shows the variation of the downlink SNR in the PCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. In the test, DRX configuration is not enabled. In the test, SSB0 is configured as the BFD-RS.

Table A.6.5.1.6.1-1: Supported test configurations for FR1 PCell

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

Table A.6.5.1.6.1-2: General test parameters for FR1 PCell for CSI-RS in-sync testing in non-DRX mode

Parameter		Unit	Value
			Test 1
Active PCell			Cell 1
RF Channel Number			1
Duplex mode	Config 1		FDD
	Config 2, 3		TDD
TDD Configuration	Config 1		Not Applicable
	Config 2		TDDConf.1.1
DI : W I DIA/D	Config 3		TDDConf.2.1
DL initial BWP configuration	Config 1, 2, 3		DLBWP.0.1
DL dedicated BWP configuration	Config 1, 2, 3		DLBWP.1.1
UL initial BWP configuration	Config 1, 2, 3		ULBWP.0.1
UL dedicated BWP configuration	Config 1, 2, 3		ULBWP.1.1
CORESET	Config 1		CR.1.1 FDD
Reference Channel	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
SSB Configuration	Config 1		SSB.1 FR1
	Config 2		SSB.1 FR1
	Config 3		SSB.2 FR1
SMTC Configuration	Config 1, 2		SMTC.1
	Config 3		SMTC.1
PDSCH/PDCCH	Config 1, 2		15 kHz
subcarrier spacing	Config 3		30 kHz
TRS configuration	Config 1		TRS.1.1 FDD
	Config 2		TRS.1.1 TDD
	Config 3		TRS.1.2 TDD
CSI-RS for RLM	Config 1		Resource #4 in TRS.1.1 FDD
	Config 2		Resource #4 in TRS.1.1 TDD
	Config 3		Resource #4 in TRS.1.2 TDD
TCI configuration for PDCCH/PDSCH			TCI.State.0
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and	Antenna Configuration		2x2 Low
Out of sync	DCI format		1-0
transmission parameters	Number of Control OFDM symbols		2
•	Aggregation level	CCE	8

T			
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE	dB	4
	energy		
	Ratio of hypothetical PDCCH	dB	4
	DMRS energy to average CSI-RS		
	RE energy		
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
In sync transmission	DCI format		1-0
parameters	Number of Control OFDM symbols		2
	Aggregation level	CCE	4
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			OFF
Gap pattern ID			N.A.
Layer 3 filtering			Enabled
T310 timer		ms	1000
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration	Config 1		CSI-RS.1.1 FDD
for CSI reporting	Config 2		CSI-RS.1.1 TDD
	Config 3		CSI-RS.2.1 TDD
T1		s	0.2
T2		S	0.2
T3		S	0.44
T4		S	0.2
T5		S	0.88
T6		S	0.84
Note 1: UE-specific	PDCCH is not transmitted after T1 sta	arts.	

Table A.6.5.1.6.1-3: Cell specific test parameters for FR1 for CSI-RS in-sync radio link monitoring in non-DRX mode

Par	ameter	Unit			Test 1			
			T1	T2	T3	T4	T5	
PDCCH_beta		dB		4				
PDCCH_DMRS	S_beta	dB			4			
PBCH_beta		dB						
PSS_beta		dB						
SSS_beta		dB			0			
PDSCH_beta		dB						
OCNG_beta		dB						
SNR on	Config 1	dB	1	-7	-15	-4.5	1	
RLM-RS	Config 2		1	-7	-15	-4.5	1	
	Config 3		1	-7	-15	-4.5	1	
SNR on other	Config 1	dB			1			
channels and	Config 2		1					
signals	Config 3				1			
$N_{oc}$	Config 1	dBm/15kHz			-98			
oc .	Config 2			•	-98		•	
	Config 3			•	-98		•	
Propagation condition				TD	L-C 300ns 10	0Hz		

- Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
- Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
- Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
- Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
- Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure A.6.5.1.6.1-1.
- Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is [A.3.6].

Table A.6.5.1.6.1-4: Void

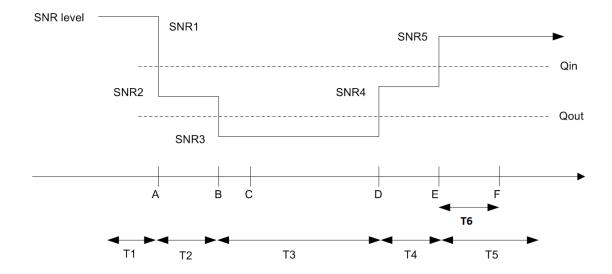


Figure A.6.5.1.6.1-1: SNR variation for CSI-RS in-sync testing

#### A.6.5.1.6.2 Test Requirements

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

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

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

## A.6.5.1.7 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with CSI-RS-based RLM in DRX mode

#### A.6.5.1.7.1 Test Purpose and Environment

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

The test parameters are given in Tables A.6.5.1.7.1-1, A.6.5.1.7.1-2, and A.6.5.1.7.1-3 below. There is one cell, cell 1 is the PCell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.6.5.1.7.1-1 shows the variation of the downlink SNR in the PCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test. In the test, SSB0 is configured as the BFD-RS.

Table A.6.5.1.7.1-1: Supported test configurations for FR1 PCell

Cor	nfiguration	Description	
1		FDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth	
2		TDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth	
3		TDD duplex mode, 30 kHz SSB SCS, 40 MHz bandwidth	
Note:	Note: The UE is only required to pass in one of the supported test configurations in FR1		

Table A.6.5.1.7.1-2: General test parameters for FR1 PCell for CSI-RS out-of-sync testing in DRX mode

Parameter		Unit	Value
			Test 1
Active PCell			Cell 1
RF Channel Number			1
Duplex mode	Config 1		FDD
	Config 2, 3		TDD
TDD Configuration	Config 1		Not Applicable
	Config 2		TDDConf.1.1
	Config 3		TDDConf.2.1
DL initial BWP	Config 1, 2, 3		DLBWP.0.1
configuration	0 5 1 0 0		DI DIME 4.4
DL dedicated BWP	Config 1, 2, 3		DLBWP.1.1
configuration UL initial BWP	Config 1, 2, 3		ULBWP.0.1
configuration	Config 1, 2, 3		ULBWP.U.1
UL dedicated BWP	Config 1, 2, 3		ULBWP.1.1
configuration	Cornig 1, 2, 3		OLDWF.1.1
CORESET	Config 1		CR.1.1 FDD
Reference Channel	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
SSB Configuration	Config 1		SSB.1 FR1
	Config 2		SSB.1 FR1
	Config 3		SSB.2 FR1
SMTC Configuration	Config 1, 2		SMTC.1
	Config 3		SMTC.1
PDSCH/PDCCH	Config 1, 2		15 kHz
subcarrier spacing	Config 3		30 kHz
TRS configuration	Config 1		TRS.1.1 FDD
	Config 2		TRS.1.1 TDD
	Config 3		TRS.1.2 TDD
CSI-RS for RLM	Config 1		Resource #4 in TRS.1.1 FDD
	Config 2		Resource #4 in TRS.1.1 TDD
	Config 3		Resource #4 in TRS.1.2 TDD
TCI configuration for F	PDCCH/PDSCH		TCI.State.0
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and	Antenna Configuration		2x2 Low
Out of sync	DCI format		1-0
transmission parameters	Number of Control OFDM symbols		2
•	Aggregation level	CCE	8

	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			DRX.3
Gap pattern ID			N.A.
Layer 3 filtering			Enabled
T310 timer		ms	0
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration	Config 1		CSI-RS.1.1 FDD
for CSI reporting	Config 2		CSI-RS.1.1 TDD
	Config 3		CSI-RS.2.1 TDD
T1		S	0.2
T2		S	1.28
T3		S	1.28
D1		S	1.24
Note 1: UE-specific	PDCCH is not transmitted after T1 sta	arts.	

Table A.6.5.1.7.1-3: Cell specific test parameters for FR1 for CSI-RS out-of-sync radio link monitoring in DRX mode

Parameter		Unit	Test 1			
			T1	T2	Т3	
PDCCH beta		dB		4		
PDCCH DMRS	S beta	dB		4		
PBCH_beta		dB				
PSS_beta		dB				
SSS_beta		dB		0		
PDSCH_beta		dB				
OCNG_beta		dB				
SNR on	Config 1	dB	1	-7	-15	
RLM-RS	Config 2		1	-7	-15	
	Config 3		1	-7	-15	
SNR on other	Config 1	dB		1		
channels and	Config 2			1		
signals	Config 3			1		
$N_{oc}$	Config 1	dBm/15kHz		-98		
OC.	Config 2			-98		
	Config 3			-98		
Propagation condition			TDL-C 300ns 100Hz			

- Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
- Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
- Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
- Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
- Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.6.5.1.7.1-1.
- Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is [A.3.6].

Table A.6.5.1.7.1-4: Void

Table A.6.5.1.7.1-5: Void

Table A.6.5.1.7.1-6: Void

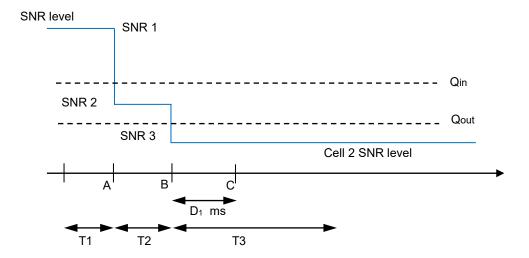


Figure A.6.5.1.7.1-1: SNR variation for CSI-RS out-of-sync testing

#### A.6.5.1.7.2 Test Requirements

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

During time durations T1, T2 and T3, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on PCell.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 (PCell) at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

The UE shall stop transmitting uplink signal in Cell 1 (PCell) no later than time point C ( $D_1$  ms after the start of the time duration T3) on the PCell.

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

# A.6.5.1.8 Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-based RLM in DRX mode

#### A.6.5.1.8.1 Test Purpose and Environment

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

The test parameters are given in Tables A.6.5.1.8.1-1, A.6.5.1.81-2, A.6.5.1.8.1-3 and A.6.5.1.8.1-3A below. There is one cells, cell 1which is the PCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.6.5.1.8.1-1 shows the variation of the downlink SNR in the PCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test. In the test, SSB0 is configured as the BFD-RS.

Table A.6.5.1.8.1-1: Supported test configurations for FR1 PSCell

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

Table A.6.5.1.8.1-2: General test parameters for FR1 PCell for CSI-RS in-sync testing in non-DRX mode

	Parameter	Unit	Value
			Test 1
Active PCell			Cell 1
RF Channel Number			1
Duplex mode	Config 1		FDD
	Config 2, 3		TDD
TDD Configuration	Config 1		Not Applicable
	Config 2		TDDConf.1.1
DI : W I DIMD	Config 3		TDDConf.2.1
DL initial BWP configuration	Config 1, 2, 3		DLBWP.0.1
DL dedicated BWP configuration	Config 1, 2, 3		DLBWP.1.1
UL initial BWP configuration	Config 1, 2, 3		ULBWP.0.1
UL dedicated BWP configuration	Config 1, 2, 3		ULBWP.1.1
CORESET	Config 1		CR.1.1 FDD
Reference Channel	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
SSB Configuration	Config 1		SSB.1 FR1
	Config 2		SSB.1 FR1
	Config 3		SSB.2 FR1
SMTC Configuration	Config 1, 2		SMTC.1
	Config 3		SMTC.1
PDSCH/PDCCH	Config 1, 2		15 kHz
subcarrier spacing	Config 3		30 kHz
TRS configuration	Config 1		TRS.1.1 FDD
	Config 2		TRS.1.1 TDD
	Config 3		TRS.1.2 TDD
CSI-RS for RLM	Config 1		Resource #4 in TRS.1.1 FDD
	Config 2		Resource #4 in TRS.1.1 TDD
	Config 3		Resource #4 in TRS.1.2 TDD
TCI configuration for F	PDCCH/PDSCH		TCI.State.0
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and Antenna Configuration			2x2 Low
Out of sync	DCI format		1-0
transmission parameters	Number of Control OFDM symbols		2
•	Aggregation level	CCE	8

	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
In sync transmission	DCI format		1-0
parameters	Number of Control OFDM symbols		2
	Aggregation level	CCE	4
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			DRX.3
Gap pattern ID			gp0
Layer 3 filtering			Enabled
T310 timer		ms	2000
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration	Config 1		CSI-RS.1.1 FDD
for CSI reporting	Config 2		CSI-RS.1.1 TDD
	Config 3		CSI-RS.2.1 TDD
T1		S	0.2
T2		S	0.2
T3		S	1.24
T4		S	0.2
T5		s	1.88
T6		s	1.84
Note 1: UE-specific	PDCCH is not transmitted after T1 sta	arts.	

Table A.6.5.1.8.1-3: Cell specific test parameters for FR1 for CSI-RS in-sync radio link monitoring in non-DRX mode

Parameter		Unit			Test 1		
			T1	T2	T3	T4	T5
PDCCH_beta		dB	4				
PDCCH_DMRS	S_beta	dB		4			
PBCH_beta		dB					
PSS_beta		dB					
SSS_beta		dB			0		
PDSCH_beta		dB					
OCNG_beta	OCNG beta						
SNR on	Config 1	dB	1	-7	-15	-4.5	1
RLM-RS	Config 2		1	-7	-15	-4.5	1
	Config 3		1	-7	-15	-4.5	1
SNR on other	Config 1	dB			1		
channels and	Config 2		1				
signals			1				
λ/ Config 1		dBm/15kHz	-98				
$N_{oc}$	Config 2		-98				
Config 3		-98					
Propagation condition			TDL-C 300ns 100Hz				

- Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
- Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
- Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
- Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
- Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure A.6.5.1.8.1-1.
- Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is [A.3.6].

Table A.6.5.1.8.1-3A: Measurement gap configuration for FR1 CSI-RS in-sync radio link monitoring in non-DRX mode

	Field			
	Value			
	0			
Note 1:	Void			

Table A.6.5.1.8.1-4: Void Table A.6.5.1.8.1-5: Void Table A.6.5.1.8.1-6: Void

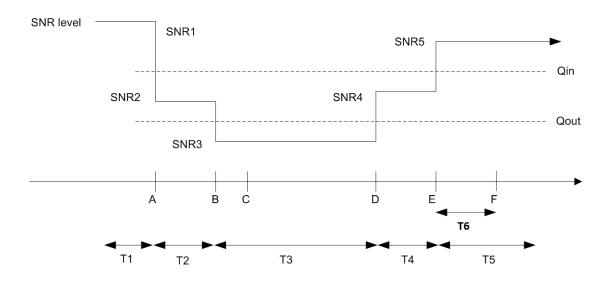


Figure A.6.5.1.8.1-1: SNR variation for CSI-RS in-sync testing

#### A.6.5.1.8.2 Test Requirements

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

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

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

### A.6.5.2 Interruption

#### A.6.5.2.1 Interruptions during measurements on deactivated NR SCC in FR1

#### A.6.5.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE missed ACK/NACK rate does not exceed the limits at NR PSCell interruptions during the measurement on the deactivated NR SCC. This test will verify the missed ACK/NACK rate for PCell in standalone NR specified in clause 8.2.2.2. Supported test configurations are shown in table A.6.5.2.1.1-1.

The general test parameters and NR cell specific test parameters are given in Table A.6.5.2.1.1-2 and A 6.5.2.1.1-3 below. In the test there are two cells: Cell1 and Cell2. Cell1 is PCell, Cell2 is an NR deactivated SCell. Cell1 shall be configured as PCell and Cell2 shall be configured as SCell.

The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE is connected to Cell1 and Cell2. The point in time at which the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated NR SCells is received at the UE antenna connector defines the start of time period T1. During T1, PCell is continuously scheduled in DL.

Table A.6.5.2.1.1-1: Interruptions during measurements on deactivated NR SCC supported test configurations

	Config	Description		
1		NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD – FDD duplex mode		
2		NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD – TDD duplex mode		
3		NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD – FDD duplex mode		
4		NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD – TDD duplex mode		
5		NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD – TDD duplex mode		
Note:	Note: The UE is only required to be tested in one of the supported test configurations			

Table A.6.5.2.1.1-2: General test parameters for interruptions during measurements on deactivated NR SCC in standalone NR

Parameter	Unit	Value	Comment
RF Channel Number		1, 2	Two NR RF channels
Active PCell		Cell1	PCell on NR RF channel number 1.
Configured deactivated SCell		Cell2	Deactivated SCell on NR RF channel number 2.
CP length		Normal	Applicable to Cell1 and Cell2
DRX		OFF	
Measurement gap pattern Id		OFF	
SCell measurement cycle (measCycleSCell)	ms	640	
T1	S	10	

Table A.6.5.2.1.1-3: NR cell specific test parameters for interruptions during measurements on deactivated NR SCC in standalone NR

Parameter		Unit	Cell1	Cell2
Frequency Range			FR1	FR1
Duplex mode	Config 1		FDD	FDD
	Config 2,5		TDD	TDD
	Confiq 3		TDD	FDD
	Confiq 4		FDD	TDD
TDD configuration	Config 1		Not Applicable	Not Applicable
	Config 2		TDDConf.1.1	TDDConf.1.1
	Config 3		TDDConf.1.1	Not Applicable
	Confiq 4		Not Applicable	TDDConf.1.1
	Confiq 5		TDDConf.1.2	TDDConf.1.2
BW <sub>channel</sub>	Config 1,2,3,4		10 MHz: N <sub>RB,c</sub> = 52	10 MHz: N <sub>RB,c</sub> = 52
	Config 5		40 MHz: N <sub>RB,c</sub> = 106	40 MHz: N <sub>RB,c</sub> = 106
Initial BWP			DLBWP.0	).2 <sup>Note6</sup>
Configuration				
PDSCH Reference	Config 1		SR.1.1 FDD	SR.1.1 FDD
measurement channel	Config 2		SR.1.1 TDD	SR.1.1 TDD
	Config 3		SR.1.1 TDD	SR.1.1 FDD
	Confiq 4		SR.1.1 FDD	SR.1.1 TDD
	Confiq 5		SR.2.1 TDD	SR.2.1 TDD
RMSI CORESET	Config 1		CR.1.1 FDD	CR.1.1 FDD
parameters	Config 2		CR.1.1 TDD	CR.1.1 TDD
	Config 3		CR.1.1 TDD	CR.1.1 FDD
	Confiq 4		CR.1.1 FDD	CR.1.1 TDD
	Confiq 5		CR.2.1 TDD	CR.2.1 TDD
Dedicated CORESET	Config 1		CCR.1.1 FDD	CCR.1.1 FDD
parameters	Config 2		CCR.1.1 TDD	CCR.1.1 TDD
	Config 3		CCR.1.1 TDD	CCR.1.1 FDD

	Config 4		CCR.1.1 FDD	CCR.1.1 TDD
	Config 5		CCR.2.1 TDD	CCR.2.1 TDD
OCNG Patterns			OP.1	OP.1
SMTC Configuration			SMTC.1	SMTC.1
SSB Configuration	Config 1,2,3,4		SSB.1 FR1	SSB.1 FR1
•	Config 5		SSB.2 FR1	SSB.2 FR1
Correlation Matrix and	d Antenna		1x2 Low	1x2 Low
Configuration				
EPRE ratio of PSS to SS				
EPRE ratio of PBCH DM				
EPRE ratio of PBCH to	_			
EPRE ratio of PDCCH D				
EPRE ratio of PDCCH to		dB	0	0
EPRE ratio of PDSCH D		╡		
EPRE ratio of PDSCH to		╡		
EPRE ratio of OCNG DI		4		
EPRE ratio of OCNG to	OCNG DMRS (Note 1)	ID /45		
N <sub>oc</sub> Note 2		dBm/15	-104	-104
OO DODD Note 3		kHz		
SS-RSRP Note 3		dBm/15	-87	-87
<u> </u>		kHz	<u> </u>	
Ês/lot		dB	17	17
Ês/Noc		dB	17	17
N <sub>oc</sub> Note 2	Config 1,2,3,4	dBm/S	-104	-104
	Config 5		-101	-101
Io <sup>Note3</sup>	Config 1,2,3,4	dBm/ 9.36MHz	-58.96	-58.96
	Config 5	dBm/ 38.16MHz	-52.86	-52.86
Time offset to Cell1 N	ote 5	μS	-	3
Propagation Condition	n	·	AWGN	AWGN
Note 1. OCNO also	وعا فمعاف عامريت امتمتري متعا الت	. 41 11 11 -	acted and a constant total transmit	4 - 4

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for Noc to be fulfilled.
- Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselvess.
- Note 4: Void
- Note 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.
- Note 6: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2 defined in clause 12 of TS 38.213 [3].

#### A.6.5.2.1.2 Test Requirements

The UE shall be continuously scheduled on PCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on PCell.

The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption on PCell shall not exceed the value defined in Table A.6.5.2.1.2-1 if the PCell is not in the same band as the deactivated SCell or Table A.6.5.2.1.2-2 if the PCell is in the same band as the deactivated SCell.

Table A.6.5.2.1.2-1: Interruption duration if the PCell is not in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length
0	1	1
1	0.5	1

Table A.6.5.2.1.2-2: Interruption duration if the PCell is in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length
0	1	1 + SMTC duration
1	0.5	2 + SMTC duration

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

### A.6.5.3 SCell Activation and Deactivation Delay

# A.6.5.3.1 SCell Activation and deactivation of known SCell in FR1 in non-DRX for 160ms SCell measurement cycle

#### A.6.5.3.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SCell activation and deactivation times are within the requirements stated in clause 8.3, when the SCell in FR1 is known by the UE at the time of activation.

The supported test configurations are shown in table A.6.5.3.1.1-1 below. The test parameters are given in Tables A.6.5.3.1.1-2 and cell-specific parameters in A.6.5.3.1.1-3 below. The test consists of three successive time periods, with duration of T1, T2 and T3, respectively. There are two NR carriers, each with one cell. Both cells have constant signal levels throughout the test. Before the test starts the UE is connected to Cell 1, but is not aware of Cell2. The UE is only monitoring the PCC. The UE shall be continuously scheduled in the PCell throughout the whole test.

At the beginning of T1 the UE receives an RRC message by which the SCell (Cell 2) becomes configured on radio channel 2. The UE now starts monitoring the SCC. The test equipment sends a MAC message for activation of the SCell.

The point in time at which the MAC message is received at the UE antenna connector, in slot # denoted n, defines the start of time period T2. The UE shall be able to report valid CSI in PCell for the activated SCell at latest in slot  $(n+T_{HARQ}+T_{activation\_time}+T_{CSI\_Reporting})$ , as defined in clause 8.3. The UE shall start reporting CSI in PCell in slot  $(n+T_{HARQ}+3ms)$  and shall report CQI index 0 (out-of-range) until the SCell activation has been completed. Any PCell interruption due to activation of SCell shall occur in the slot  $(n+1+[T_{HARQ}]+3ms)$  to  $(n+1+[T_{HARQ}]+3ms+T_{SSB}]$  max $+T_{SMTC}$  duration], as defined in clause 8.3.

Time period T3 starts when a MAC message for deactivation of SCell, sent from the test equipment to the UE in a slot # denoted m, is received at the UE antenna connector. The UE shall carry out deactivation of the SCell in a slot  $(n+[T_{HARQ}+3ms])$ , as defined in clause 8.3, and any PCell interruption due to the deactivation shall occur in the slot  $(n+1+[T_{HARQ}+3ms])$  to  $(n+1+[T_{HARQ}+3ms])$ , as defined in clause 8.3.

The test equipment verifies that potential interruption is carried out in the correct time span by monitoring ACK/NACK sent in PCell during activation and deactivation of SCell, respectively.

The test equipment verifies the activation time by counting the slots from the time when the SCell activation command is sent until a CSI report with other than CQI index 0 is received.

The test equipment verifies the deactivation time by counting the slots from the time when the SCell deactivation command is sent until CQI reporting for SCell is discontinued.

Table A.6.5.3.1.1-1: known FR1 SCell activation in non-DRX for 160ms SCell measurement cycle supported test configurations

Config	Description			
1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode			
2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode			
3	NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode			
Note: The UE is only required to be tested in one of the supported test configurations				

Table A.6.5.3.1.1-2: General test parameters for known FR1 SCell activation case, 160ms SCell measurement cycle

Parameter	Unit	Value	Comment
RF Channel Number		1,2	Two NR radio channel (1, 2) are used for this test
Active PCell		Cell 1	Primary cell on NR RF channel number 1.
Configured deactivated SCell		Cell 2	Configured deactivated secondary cell on NR RF channel number 2
CP length		Normal	
DRX		OFF	Continuous monitoring of primary cell
CQI/PMI periodicity and offset configuration index		0	CQI reporting for SCell every second subframe
Cell-individual offset for cells on NR channel number	dB	0	Individual offset for cells on primary component carrier.
SCell measurement cycle (measCycleSCell)	ms	160	
Cell2 timing offset to cell1	μS	0	
Time alignment error between cell2 and cell1	μS	≤ Time alignment error as specified in TS 38.104 [13] clause 6.5.3.1.	The value of time alignment error depends upon the type of carrier aggregation.
T1	S	7	During this time the PSCell shall be known and the SCell configured and detected.
T2	s	1	During this time the UE shall activate the SCell.
Т3	S	1	During this time the UE shall deactivate the SCell.
Tharq	slot	k	k is a number of slots and is indicated by the PDSCH-to-HARQ-timing-indicator field in the DCI format, if present, or provided by dl-DataToUL-ACK, the value of k should be the minimum value defined in TS 38.213 [3] depends on UE's capability
TCSI_Reporting	ms	2	the delay uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [2]

Table A.6.5.3.1.1-3: Cell specific test parameters for known FR1 SCell activation case, 160ms SCell measurement cycle

Parameter		Unit	T1		T2		Т3	
		Unit	Cell 1	Cell 2	Cell 1	Cell 2	Cell 1	Cell 2
Dunlay mada	Config 1		FDD					
Duplex mode Config 2,3					TE	DD		

	Config 1			Not applicable					
TDD configuration	Config 2	_	TDDConf.1.1 TDDConf.1.2						
	Config 3								
BW <sub>channel</sub>	Config 1,2 Config 3	MHz				B,c = 52			
		40: N <sub>RB,c</sub> = 106							
Initial BWP configuration				DLBW	/P.0.2				
TCI state					TCI.S	tate.0			
TRS Configuration					TRS.1.	.1 TDD			
	Config 1		SR.1.1 FDD		SR.1.1 FDD		SR.1.1 FDD		
PDSCH Reference measurement channel	Config 2		SR.1.1 TDD	-	SR.1.1 TDD	-	SR.1.1 TDD	-	
	Config 3		SR2.1 TDD		SR2.1 TDD		SR2.1 TDD		
	Config 1		CCR.1. 1 FDD		CCR.1. 1 FDD		CCR.1. 1 FDD		
Dedicated CORESET parameters	Config 2		CCR.1. 1 TDD	-	CCR.1. 1 TDD	-	CCR.1. 1 TDD	-	
	Config 3		CCR2.1 TDD		CCR2. 1 TDD		CCR2.1 TDD		
	Config 1		CR.1.1 FDD		CR.1.1 FDD		CR.1.1 FDD		
RMSI CORESET parameters	Config 2		CR.1.1 TDD	-	CR.1.1 TDD	-	CR.1.1 TDD	-	
	Config 3		CR2.1 TDD		CR2.1 TDD		CR2.1 TDD		
OCNG Patterns					OF	P.1			
	Config 1,2				SSB.				
COB Comigaration	Config 3				SSB.2	2 FR1			
SMTC configuration					SMT	ΓC.1			
EPRE ratio of PSS to SSS EPRE ratio of PBCH DMRS EPRE ratio of PBCH to PBCH ratio of PDCCH DMRS EPRE ratio of PDCCH DMRS EPRE ratio of PDCCH to PBCH ratio of PDSCH DMRS EPRE ratio of PDSCH DMRS EPRE ratio of PDSCH DMRS	dB	0							
EPRE ratio of OCNG to OCNG DMRS (Note 1)					-1(	04			
$N_{oc}^{\text{Note2}}$ Config 3,6		dBm/15kHz			-10				
$\hat{E}_{s}/I_{ot}$	dB			1	7				
$\hat{E}_s/N_{oc}$		dB			1	7			
SS-RSRP <sup>Note3</sup>	Config 1,2,4,5 Config 3,6	dBm/SCS			-8 -8	37 34			

SCH_RP Note 3		dBm/15 kHz	-87			
Propagation condition		-	AWGN			
			allocated and a constant total transmitted power spectral			
Note 2:			of specified in the test is assumed to be constant over JGN of appropriate power for $N_{oc}$ to be fulfilled.			
Note 3:	are not settable parameters thems	ave been derived from other parameters for information purposes. They iselves.				
Note 4:	The uplink resources for CSI repo	rting are assigne	ed to the UE prior to the start of time period T2.			

#### A.6.5.3.1.2 Test Requirements

During T2 the UE shall send the first CSI report for SCell in a slot ( $n+T_{HARQ}+3$ ms).

During T2 the UE shall start sending CSI reports for SCell with non-zero CQI index at latest in a slot  $(n+T_{HARQ}+T_{activation\_time}+T_{CSI\_Reporting})$ ,  $T_{activation\_time}=[5 \text{ ms}+T_{SMTC\_SCell}]$ , as defined in clause 8.3.

During T3 the UE shall stop sending CSI reports for SCell at latest in a slot ( $n+[T_{HARQ}+3ms]$ ), as defined in clause 8.3.

During T2 interruption of PCell / PSCell during SCell activation shall not happen outside the slot ( $n+1+[T_{HARQ}]$ ) to ( $n+1+[T_{HARQ}+3ms+T_{SSB\ max}+T_{SMTC\ duration}]$ ), as defined in clause 8.3.

During T3 interruption of PCell / PSCell during SCell deactivation shall not happen outside the slot  $(n+1+[T_{HARQ}])$  to  $(m+1+[T_{HARQ}+3ms])$ , as defined in clause 8.3.

The interruption on any activated serving cell shall not be more than the values specified for SA in clause 8.2.2.2.2.

All of the above test requirements shall be fulfilled in order for the observed SCell activation delay and SCell deactivation delay to be counted as correct. The rate of correct observed SCell activation delay and SCell deactivation delay during repeated tests shall be at least 90%.

NOTE: During T2 if there are no uplink resources for reporting the valid CSI in a slot (n+T<sub>HARQ</sub>+T<sub>activation\_time</sub>+T<sub>CSI\_Reporting</sub>) as defined in clause 8.3 then the UE shall use the next available uplink resource for reporting the corresponding valid CSI.

# A.6.5.3.2 SCell Activation and deactivation of known SCell in FR1 in non-DRX for 320ms SCell measurement cycle

#### A.6.5.3.2.1 Test Purpose and Environment

The purpose of this test case is the same as for the test defined in clause A.6.5.3.1.1. The supported test configurations are the same as defined in clause A.6.5.3.1.1. The test parameters are the same except those described in the following clause. The listed parameter values in Tables A.6.5.3.2.1-1 will replace the values of corresponding parameters in Tables A.4.5.3.1.1-1.

Table A.6.5.3.2.1-1: General test parameters for known FR1 SCell activation case, 320ms SCell measurement cycle

Parameter	Unit	Value	Comment
SCell measurement cycle	ms	320	
(measCycleSCell)	1115	320	

#### A.6.5.3.2.2 Test Requirements

The test requirements defined in clause A.6.5.3.1.2 shall apply to this test case, except  $T_{activation\_time}$  will be replaced with the value [ $T_{SMTC\ MAX} + T_{SMTC\ SCell} + 5ms$ ].

#### A.6.5.3.3 SCell Activation and deactivation of unknown SCell in FR1 in non-DRX

#### A.6.5.3.3.1 Test Purpose and Environment

The purpose of this test is to verify that the SCell activation and deactivation times are within the requirements stated in clause 8.3, when the SCell in FR1 is unknown by the UE at the time of activation.

The supported test configurations are the same as defined in clause A.6.5.3.1.1. The test parameters are the same except those described in the following clause. The listed parameter values in Tables A.6.5.3.3.1-1 will replace the values of corresponding parameters in Tables A.6.5.3.1.1-1. The test consists of three successive time periods, with duration of T1, T2 and T3, respectively. There are two NR carriers, each with one cell. Both cells have constant signal levels throughout the test. Before the test starts the UE is connected to Cell 1, but is not aware of Cell2. The UE is only monitoring the PCC. The UE shall be continuously scheduled in the PCell throughout the whole test.

At the beginning of T1 the UE receives an RRC message by which the SCell (Cell 2) becomes configured on radio channel 2. The UE now starts monitoring the SCC. The test equipment sends a MAC message for activation of the SCell.

The point in time at which the MAC message is received at the UE antenna connector, in slot # denoted n, defines the start of time period T2. The UE shall be able to report valid CSI in PCell for the activated SCell at latest in slot  $(n+T_{HARQ}+T_{activation\_time}+T_{CSI\_Reporting})$ , as defined in clause 8.3. The UE shall start reporting CSI in PCell in slot  $(n+T_{HARQ}+3ms)$  and shall report CQI index 0 (out-of-range) until the SCell activation has been completed. Any PCell interruption due to activation of SCell shall occur in the slot  $(n+1+[T_{HARQ}]+3ms)$  to  $(n+1+[T_{HARQ}]+3ms)$  to  $(n+1+[T_{HARQ}]+3ms)$  and shall report CQI index 0 (out-of-range) until the SCell activation has been completed. Any PCell interruption due to activation of SCell shall occur in the slot  $(n+1+[T_{HARQ}]+3ms)$  to  $(n+1+[T_{HARQ}]+3ms)$  to  $(n+1+[T_{HARQ}]+3ms)$  and shall report CQI index 0 (out-of-range) until the SCell activation has been completed.

Time period T3 starts when a MAC message for deactivation of SCell, sent from the test equipment to the UE in a slot # denoted m, is received at the UE antenna connector. The UE shall carry out deactivation of the SCell in a slot  $(n+[T_{HARQ}+3ms])$ , as defined in clause 8.3, and any PCell interruption due to the deactivation shall occur in the slot  $(n+1+[T_{HARQ}+3ms])$  to  $(n+1+[T_{HARQ}+3ms])$ , as defined in clause 8.3.

The test equipment verifies that potential interruption is carried out in the correct time span by monitoring ACK/NACK sent in PCell during activation and deactivation of SCell, respectively.

The test equipment verifies the activation time by counting the slots from the time when the SCell activation command is sent until a CSI report with other than CQI index 0 is received.

The test equipment verifies the deactivation time by counting the slots from the time when the SCell deactivation command is sent until CQI reporting for SCell is discontinued.

Table A.6.5.3.3.1-1: General test parameters for unknown FR1 SCell activation case, 160ms SCell measurement cycle

Parameter	Unit	Value	Comment
T1	ms	100	During this time the PSCell shall be known and the SCell configured, but not detected.

#### A.6.5.3.3.2 Test Requirements

The test requirements defined in clause A.6.5.3.1.2 shall apply to this test case, except  $T_{activation\_time}$  will be replaced with the value [5 ms+2\* $T_{SMTC\ MAX}$ +2\* $T_{SMTC\ SCell}$ ] as defined in clause 8.3.

### A.6.5.4 UE UL carrier RRC reconfiguration Delay

#### A.6.5.4.1 UE UL carrier RRC reconfiguration Delay

Table A.6.5.4.1-1 - Table A.6.5.4.1-4: Void

#### A.6.5.4.1.1 Test Purpose and Environment

The purpose of this test is to verify that when the UE receives a RRC message implying NR UL or Supplementary UL carrier configuration, the UE shall be ready to start transmission on the newly configured carrier within the time limits specified in clause 8.4.2 and 8.4.3 for configuring and deconfiguring, respectively.

There are two cells: FR1 PCell (cell 1) and FR1 SCell (cell 2). Both NR uplink and supplementary uplink are broadcast by *ServingCellConfigCommonSIB*. The test parameters for PCell and SCell are given in Table A. 6.5.4.1.1-1, Table A.6.5.4.1.1-2, Table A.6.5.4.1.1-3 and Table A.6.5.4.1.1-4 below. In test 1, the test consists of three time periods, with duration of T1, T2 and T3 respectively. During time duration T1, NR uplink of cell 2 is configured to UE. At the start of T2, a supplementary uplink of cell 2 is configured to UE through *RRCReconfiguration*, then UE shall start transmission both on the NR uplink and supplementary uplink. At the start of T3, the supplementary uplink is released through *RRCReconfiguration*.

In test 2, the test consists of three time periods, with duration of T1, T2 and T3 respectively. During time duration T1, supplementray uplink on cell 2 is configured to UE. At the start of T2, a NR uplink is configured to UE through *RRCReconfiguration*, then UE shall start transmission both on the NR uplink and supplementary uplink. At the start of T3, the NR uplink is released through *RRCReconfiguration*.

Table A.6.5.4.1.1-1: Supported test configurations

Configuration	PCell (Cell 1)	SCell (Cell 2)
1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	DL and UL: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode; SUL: 15 kHz SCS, 10 MHz bandwidth, SUL duplex mode
2	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	DL and UL: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode; SUL: 15 kHz SCS, 10 MHz bandwidth, SUL duplex mode
3	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	DL and UL: 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode; SUL: 30kHz SCS, 40 MHz bandwidth, SUL duplex mode
4	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	DL and UL: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode; SUL: 15 kHz SCS, 10 MHz bandwidth, SUL duplex mode
5	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	DL and UL: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode; SUL: 15 kHz SCS, 10 MHz bandwidth, SUL duplex mode
6	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	DL and UL: 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode; SUL: 30kHz SCS, 40 MHz bandwidth, SUL duplex mode
7	30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode	DL and UL: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode; SUL: 15 kHz SCS, 10 MHz bandwidth, SUL duplex mode
8	30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode	DL and UL: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode; SUL: 15 kHz SCS, 10 MHz bandwidth, SUL duplex mode

9	30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode	DL and UL: 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode; SUL: 30kHz SCS, 40 MHz bandwidth, SUL duplex mode
Note: The UE	is only required to be tested in one of the supported te	est configurations

Table A.6.5.4.1.1-2: General test parameters for NR standalone UE UL carrier RRC reconfiguration Delay on Pcell

Parameter	Unit	Test configuration	Value	Comment
RF Channel		Config 1,2,3, 4,	1, 2	Three radio channels are used for these
Number		5, 6, 7, 8, 9		two tests.
Active cell		Config 1,2,3, 4,	Cell 1: FR1 PCell	E-UTRAN PCell on RF channel number 1
		5, 6, 7, 8, 9	Cell 2: FR1 SCell	FR1 SCell on RF channel number 2
CP length		Config 1,2,3, 4,	Normal	
		5, 6, 7, 8, 9		
DRX		Config 1,2,3, 4,	OFF	
		5, 6, 7, 8, 9		
Measurement		Config 1,2,3, 4,	OFF	
gap pattern ld		5, 6, 7, 8, 9		
Filter coefficient		Config 1,2,3, 4,	0	L3 filtering is not used
		5, 6, 7, 8, 9		
T1		Config 1,2,3, 4,	5	
	S	5, 6, 7, 8, 9		
T2		Config 1,2,3, 4,	5	
	S	5, 6, 7, 8, 9		
T3		Config 1,2,3, 4,	5	
	S	5, 6, 7, 8, 9		

Table A.6.5.4.1.1-3: NR Cell specific test parameters for NR standalone UE UL carrier RRC reconfiguration Delay on PCell (Cell 1)

Parameter	Unit	Test	Test 1		Test 2			
		Configuration	T1 T2	T3	T1	T2	Т3	
Channel number		Conf 1, 2, 3, 4,	2			2		
Onamici mamber		5, 6, 7, 8, 9						
		Conf 1, 2, 3	N/A		TDD	N/A		
TDD configuration		Conf 4, 5, 6	TDD Conf.1			Conf.1.1		
		Conf 7, 8, 9 Conf 1, 2, 3	TDD Conf.2 10: N <sub>RB,c</sub> = 5		TDD Conf.2.1 10: N <sub>RB,c</sub> = 52			
BW <sub>channel</sub>	MHz	Conf 4, 5, 6	10: N <sub>RB,c</sub> = 5			$N_{RB,c} = 52$		
DVVcnannei	IVII IZ	Conf 7, 8, 9	40: N <sub>RB,c</sub> = 1			$I_{RB,c} = 32$		
PDSCH reference		Conf 1, 2, 3	SR.1.1 FDI			1.1 FDD	<u>,                                      </u>	
measurement		Conf 4, 5, 6	SR.1.1 TDD			.1.1 TDD		
channel as defined		Conf 7, 8, 9	SR 2.1 TDI	)	SB	2.1 TDD		
in A.3.1.1								
RMSI CORESET		Conf 1, 2, 3	CR.1.1 FDI			.1.1 FDD		
reference		Conf 4, 5, 6	CR.1.1 TDI	)	CR.	.1.1 TDD		
measurement channel as defined		Conf 7, 8, 9	CR.2.1 TDI	)	CR	.2.1 TDD		
in A.3.1.2			O11.2.1 1DL	•	J Ort.	2.1 100		
RMC CORESET		Conf 1, 2, 3	CCR.1.1 FD	D	CCR	R.1.1 FDD		
reference		Conf 4, 5, 6	CCR.1.1 TD		CCR	R.1.1 TDD		
measurement		Conf 7, 8, 9						
channel as defined			CCR.2.1 TD	D	CCR	R.2.1 TDD		
in A.3.1.3		0						
OCNG Pattern Note 1		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	OP.1		OP.1			
		Conf 1, 2, 3, 4,						
SSB configuration		5, 6	SSB.1 FR1		SS	SSB.1 FR1		
		Conf 7, 8, 9	SSB.2 FR1		SSB.2 FR1			
SMTC configuration		Conf 1, 2, 3, 4,	SMTC.1		SMTC.1			
_		5, 6, 7, 8, 9	0 0					
DL initial BWP configuration		Conf 1, 2, 3, 4,	DLBWP.0.		DLE	BWP.0.1		
DL dedicated BWP		5, 6, 7, 8, 9 Conf 1, 2, 3, 4,						
configuration		5, 6, 7, 8, 9	DLBWP.1.		DLE	DLBWP.1.1		
UL dedicated BWP		Conf 1, 2, 3, 4,	LII DWD 4	1		DWD 4.4		
configuration		5, 6, 7, 8, 9	ULBWP.1.1		ULI	BWP.1.1		
EPRE ratio of PSS								
to SSS								
EPRE ratio of								
PBCH_DMRS to SSS								
EPRE ratio of PBCH								
to PBCH DMRS								
EPRE ratio of								
PDCCH DMRS to		Comf 4 0 0 4						
SSS	dB	Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	0			0		
EPRE ratio of		3, 0, 7, 0, 9						
PDCCH to								
PDCCH_DMRS								
EPRE ratio of PDSCH DMRS to								
SSS								
EPRE ratio of								
PDSCH to								
PDSCH_DMRS								

EPRE ratio of OCNG DMRS to SSS								
EPRE ratio of OCNG to OCNG DMRS								
	dBm / 15kHz	Conf 1, 2, 3, 4, 5, 6, 7, 8, 9		-102			-102	
$N_{oc}$ Note 2	dBm/ SCS	Conf 1,2,3,4,5,6		-102			-102	
	303	Conf 7,8,9		-99			-99	
$\hat{E}_s/N_{oc}$	dB	Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	16	16	16	16	16	16
$\hat{E}_{s}/I_{ot}$ Note 3	dB	Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	16	16	16	16	16	16
SS-RSRP Note 3	dBm/ SCS	Conf 1,2,3,4,5,6	-86	-86	-86	-86	-86	-86
	303	Conf 7,8,9	-83	-83	-83	-83	-83	-83
	dBm/ 9.36	Conf 1,2,3,4,5,6	-57.9	-57.9	-57.9	-57.9	-57.9	-57.9
Io Note 3	MHz dBm/ 38.16 MHz	Conf 7,8,9	-51.8	-51.8	-51.8	-51.8	-51.8	-51.8
Propagation Condition		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9		AWGN			AWGN	
Antenna configuration		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9		1 x 2			1 x 2	

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

NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over

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

NOTE 3:  $\hat{E}_s/I_{ot}$ , Io, and SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table A.6.5.4.1.1-4: NR Cell specific test parameters for NR standalone UE UL carrier RRC reconfiguration Delay on SCell (Cell 2)

Parameter	Unit	Test	Test 1		Test 2				
		Configuration	T1	T2	T3	T1	T2	Т3	
Channel number		Conf 1, 2, 3, 4,		3			3		
		5, 6, 7, 8, 9							
TDD		Conf 1, 4, 7	N/A			N/A			
TDD configuration		Conf 2, 5, 8		TDDConf.1		TDDConf.1.1			
		Conf 3, 6, 9		TDDConf.2			TDDConf.2.1		
BW <sub>channel</sub>	MHz	Conf 1, 4, 7 Conf 2, 5, 8		10: N <sub>RB,c</sub> = 5			$\frac{10: N_{RB,c} = 52}{10: N_{RB,c} = 52}$		
DVVchannel	IVII IZ	Conf 3, 6, 9	10: N <sub>RB,c</sub> = 52 40: N <sub>RB,c</sub> = 106			$10. N_{RB,c} = 32$ $10. N_{RB,c} = 106$			
		Conf 1, 4, 7	G-	G-FR1-	G-FR1-				
		., ., .	FR1-	A3-3 in	A3-3 in	N1/A	G-FR1-	NI/A	
			A3-3 in	[13]	[13]	N/A	A3-3 in	N/A	
			[13]				[13]		
		Conf 2, 5, 8	G-	G-FR1-	G-FR1-		G-FR1-		
PUSCH parameters			FR1-	A3-3 in	A3-3 in	N/A	A3-3 in	N/A	
for NR UL carrier			A3-3 in	[13]	[13]		[13]	,, .	
		Comf 2 C O	[13]	G-FR1-	G-FR1-				
		Conf 3, 6, 9	G- FR1-	A3-7 in	A3-7 in		G-FR1-		
			A3-7 in	[13]	[13]	N/A	A3-7 in	N/A	
			[13]	[10]	[10]		[13]		
		Conf 1, 4, 7	Table	Table	Table				
		, ,	8.3.3.1	8.3.3.1.	8.3.3.1.2	NI/A	NI/A	NI/A	
			.2-1 in	2-1 in	-1 in [13]	N/A	N/A	N/A	
			[13]	[13]					
		Conf 2, 5, 8	Table	Table	Table				
PUCCH parameters			8.3.3.1	8.3.3.1.	8.3.3.1.2	N/A	N/A	N/A	
For NR UL carrier			.2-1 in	2-1 in	-1 in [13]				
		Conf 3, 6, 9	[13] Table	[13] Table	Table				
		Com 3, 0, 9	8.3.3.1	8.3.3.1.	8.3.3.1.2				
			.2-2 in	2-2 in	-2 in [13]	N/A	N/A	N/A	
			[13]	[13]					
		Conf 1, 4, 7		G-FR1-		G-FR1-	G-FR1-	G-FR1-	
			N/A	A3-3 in	N/A	A3-3 in	A3-3 in	A3-3 in	
<b>5</b> 110011				[13]		[13]	[13]	[13]	
PUSCH parameters		Conf 2, 5, 8	NI/A	G-FR1-	NI/A	G-FR1-	G-FR1-	G-FR1-	
for supplementary UL			N/A	A3-3 in [13]	N/A	A3-3 in [13]	A3-3 in [13]	A3-3 in [13]	
OL		Conf 3, 6, 9		G-FR1-		G-FR1-	G-FR1-	G-FR1-	
		Oom 3, 0, 9	N/A	A3-7 in	N/A	A3-7 in	A3-7 in	A3-7 in	
			1 1,7 1	[13]	1 177	[13]	[13]	[13]	
		Conf 1, 4, 7				Table	Table	Table	
			N/A	N/A	N/A	8.3.3.1.2	8.3.3.1.2	8.3.3.1.2	
						-1 in [13]	-1 in [13]	-1 in [13]	
PUCCH parameters		Conf 2, 5, 8				Table	Table	Table	
for supplementary			N/A	N/A	N/A	8.3.3.1.2	8.3.3.1.2	8.3.3.1.2	
UL						-1 in [13]	-1 in	-1 in [13]	
		Conf 3, 6, 9				Table	[13] Table	Table	
		Join 3, 0, 9	N/A	N/A	N/A	8.3.3.1.2	8.3.3.1.2	8.3.3.1.2	
			. 4// \	13//	1377	-2 in [13]	-2 in [13]	-2 in [13]	
PDSCH reference		Conf 1, 4, 7		SR.1.1 FD	D		SR.1.1 FDD		
measurement Conf 2, 5, 8			SR.1.1 TD			SR.1.1 TDD			
channel as defined in A.3.1.1		Conf 3, 6, 9		SR 2.1 TD			SR 2.1 TDD		
ш Д.О.Т.Т		Conf 1, 4, 7		CR.1.1 FD	D		CR.1.1 FDD	1	

DMCI CODECET	1	Conf 2 E 0	1	CD 4 4 TDI	<u> </u>	I	CD 1 1 TDD	<u> </u>	
RMSI CORESET reference		Conf 2, 5, 8		CR.1.1 TDI	ט	CR.1.1 TDD			
measurement		Conf 3, 6, 9							
channel as defined				CR.2.1 TDI	D	CR.2.1 TDD			
in A.3.1.2									
RMC CORESET		Conf 1, 4, 7		CR.1.1 FD	ND.	CCR.1.1 FDD			
reference						CCR.1.1 FDD CCR.1.1 TDD			
measurement		Conf 2, 5, 8	CCR.1.1 TDD				CR.I.I IDI	<i>.</i>	
		Conf 3, 6, 9	,	CD 0 4 TD	ND.	,		_	
channel as defined			_	CCR.2.1 TD	טט		CCR.2.1 TDI	J	
in A.3.1.3 OCNG Pattern Note 1		Conf 1 2 2		OP.1			OD 1		
OCNG Pattern		Conf 1, 2, 3		UP.1			OP.1		
000 5 1		Conf 1, 2, 4, 5,		SSB.1 FR	1		SSB.1 FR1		
SSB configuration		7,8		000 0 50			000 0 504		
		Conf 3, 6, 9		SSB.2 FR	1		SSB.2 FR1		
SMTC configuration		Conf 1, 2, 3, 4,		SMTC.1			SMTC.1		
		5, 6, 7, 8, 9							
DL initial BWP		Conf 1, 2, 3, 4,		DLBWP.0.	1		DLBWP.0.1		
configuration		5, 6, 7, 8, 9			-				
DL dedicated BWP		Conf 1, 2, 3, 4,		DLBWP.1.	1		DLBWP.1.1		
configuration		5, 6, 7, 8, 9			•				
UL dedicated BWP		Conf 1, 2, 3, 4,		ULBWP.1.	1		ULBWP.1.1		
configuration		5, 6, 7, 8, 9		OLDVVI .I.	1		CLDVVI . I. I		
EPRE ratio of PSS									
to SSS									
EPRE ratio of									
PBCH_DMRS to									
SSS									
EPRE ratio of PBCH									
to PBCH DMRS									
EPRE ratio of									
PDCCH_DMRS to									
SSS									
EPRE ratio of									
PDCCH to									
PDCCH DMRS	dB	Conf 1, 2, 3, 4,		0			0		
EPRE ratio of	QD.	5, 6, 7, 8, 9		O			O		
PDSCH_DMRS to									
SSS									
EPRE ratio of									
PDSCH to									
PDSCH DMRS									
EPRE ratio of OCNG DMRS to									
SSS									
EPRE ratio of									
OCNG to OCNG									
DMRS		0 (1 0 - 1							
	dBm /	Conf 1, 2, 3, 4,		-102			-102		
	15kHz	5, 6, 7, 8, 9		-102			.02		
$N_{oc}$ Note 2	dBm/	Conf 1, 2, 4, 5,	-102				-102		
1 '0C	SCS	7,8							
	555	Conf 3, 6, 9	-99			-99			
$\hat{E}_s/N_{oc}$	dB	Conf 1, 2, 3, 4,	16	16	16	16	16	16	
	uD	5, 6, 7, 8, 9	10	10	10	10	10	10	
$\hat{E}_s/I_{ot}$ Note 3	٦D	Conf 1, 2, 3, 4,	4.0	40	4.0	40	40	40	
$\mathbf{L}_{\mathrm{s}}/1_{\mathrm{ot}}$ Note 3	dB	5, 6, 7, 8, 9	16	16	16	16	16	16	
	15 '	Conf 1, 2, 4, 5,	00	00	00	20	20	00	
SS-RSRP Note 3	dBm/		-86	-86	-86	-86	-86	-86	
	SCS	7,8 Conf 3, 6, 9	-83	-83	-83	-83	-83	-83	
L									

Io Note 3	dBm/ 9.36 MHz	Conf 1, 2, 4, 5, 7,8	-57.9	-57.9	-57.9	-57.9	-57.9	-57.9
	dBm/ 38.16 MHz	Conf 3, 6, 9	-51.8	-51.8	-51.8	-51.8	-51.8	-51.8
Propagation Condition		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9		AWGN			AWGN	
Antenna configuration		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	1 x 2			1 x 2		

- NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.
- NOTE 3:  $\hat{E}_s/I_{ot}$ , lo, and SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

#### A.6.5.4.1.2 Test Requirements

In test 1 the UE shall be ready to start transmission on the supplementary uplink carrier on SCell within 20ms from the start of T2.

In test 1 the UE shall stop the transmission on the supplementary uplink carrier on SCell within 20ms from the start of T3.

In test 2 the UE shall be ready to start transmission on the NR uplink carrier on SCell within 20ms from the start of T2

In test 2 the UE shall stop the transmission on the NR uplink carrier on SCell within 20ms from the start of T3.

All of the above test requirements shall be fulfilled in order for the observed UE UL carrier configuration delay and UE UL carrier release delay to be counted as correct. The rate of correct observed UE UL carrier configuration delay and UE UL carrier release delay during repeated tests shall be at least 90%.

#### A.6.5.4.2 Void

### A.6.5.5 Beam Failure Detection and Link recovery procedures

## A.6.5.5.1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode

#### A.6.5.5.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set  $q_0$  configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.6.5.5.1.1-1, A.6.5.5.1.1-2, A.6.5.5.1.1-3 and A.6.5.5.1.1-4 below. There is one cell, cell 1 which is the active cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.6.5.5.1.1-1 shows the variation of the downlink SNR of the SSB in set  $q_0$  in the active cell to emulate SSB based beam failure. Figure A.6.5.5.1.1-1 additionally shows the variation of the downlink SNR of the SSB in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of

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

Table A.6.5.5.1.1-1: Supported test configurations for FR1 PCell

Co	nfiguration	Description
1		FDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth
2		TDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth
3		TDD duplex mode, 30kHz SSB SCS, 40 MHz bandwidth
Note:	The UE is only re	equired to pass in one of the supported test configurations in FR1

Table A.6.5.5.1.1-2: General test parameters for FR1 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode

Parameter			Value	Comment
			Test 1	
Active PSCell			Cell 1	
RF Channel Number			1	
Duplex mode	Config 1		FDD	
•	Config 2, 3		TDD	
BWchannel	Config 1	MHz	10: NRB,c = 52	
	Config 2		10: NRB,c = 52	
	Config 3		40: NRB,c = 106	
DL initial BWP configuration	Config 1, 2, 3		DLBWP.0.1	
DL dedicated BWP configuration	Config 1, 2, 3		DLBWP.1.1	
UL initial BWP configuration	Config 1, 2, 3		ULBWP.0.1	
UL dedicated BWP configuration	Config 1, 2, 3		ULBWP.1.1	
TDD Configuration	Config 1		Not Applicable	
	Config 2		TDDConf.1.1	
	Config 3		TDDConf.1.2	
CORESET Reference Channel	Config 1		CR. 1.1 FDD	
	Config 2		CR. 1.1 TDD	
	Config 3		CR. 2.1 TDD	
SSB Configuration	Config 1		SSB.3 FR1	
	Config 2		SSB.3 FR1	
	Config 3		SSB.4 FR1	
SMTC Configuration	Config 1, 2		SMTC.1	
	Config 3		SMTC.1	
PDSCH/PDCCH subcarrier	Config 1, 2		15 KHz	
spacing	Config 3		30 KHz	
PRACH Configuration	Config 1, 2		Table A.3.8.2.4-1	
	Config 3		Table A.3.8.2.4-1	
SSB Index assigned as BFD RS			0	
SSB Index assigned as CBD RS	(q <sub>1</sub> )		1	
OCNG parameters			OP.1	

CP length			Normal	1
Correlation Matrix and Ant	onna Configuration		2x2 Low	
Beam failure detection	DCI format		1-0	
transmission parameters	Number of Control OFDM symbols		2	
	Aggregation level	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0	
	DMRS precoder granularity		REG bundle size	
	REG bundle size		6	
DRX			OFF	
	Gap pattern ID		gp0	
rlmInSyncOutOfSyncThreshold			absent	When the field is absent, the UE applies the value 0. (Table 8.1.1-1).
rsrp-ThresholdSSB		dBm	-98	Threshold used for Qout_LR_SSB
powerControlOffsetSS	powerControlOffsetSS		db0	Used for deriving rsrp- ThresholdCSI-RS
beamFailureInstanceMaxC	Count		n1	see clause 5.17 of TS 38.321 [7]
beamFailureDetectionTime	er		pbfd4	see clause 5.17 of TS 38.321 [7]
CSI-RS configuration for	Config 1		[CSI-RS.1.1 FDD]	
CSI reporting	Config 2		[CSI-RS.1.1 TDD]	
	Config 3		[CSI-RS.2.3 TDD]	
CSI-RS for tracking	Config 1		[TRS.1.1 FDD]	
	Config 2		[TRS.1.1 TDD]	
	Config 3		[TRS.1.2 TDD]	
SSB Index assigned as RLM RS		0, 1		
T310 Timer	ms	1000		
N310		2		
T1		S	0.2	During this time the the UE shall be fully synchronized to cell 1
T2		S	0.37	
T3		S	0.24	
T4		S	0	
T5		S	0.17	
D1		S	0.13	

Note 1: All configurations are assigned to the UE prior to the start of time period T1.

Note 2: UE-specific PDCCH is not transmitted after T1 starts.

Table A.6.5.5.1.1-3: Cell specific test parameters for FR1 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode

Parameter		Unit			Test 1		
		-	T1	T2	Т3	T4	T5
EPRE ratio of PDCCH DMRS to SSS		dB					
EPRE ratio of	PDCCH to PDCCH DMRS	dB					
EPRE ratio of	PBCH DMRS to SSS	dB					
EPRE ratio of	PBCH to PBCH DMRS	dB					
EPRE ratio of	PSS to SSS	dB			0		
EPRE ratio of	PDSCH DMRS to SSS	dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of	OCNG to OCNG DMRS	dB					
SNR_SSB of	Config 1		5	-3	-12	-12	-12
set q <sub>0</sub>	Config 2	dB	5	-3	-12	-12	-12
	Config 3		5	-3	-12	-12	-12
SNR SSB of	Config 1		-12	-12	5	5	5
set q <sub>1</sub>	Config 2	dB	-12	-12	5	5	5
set q1	Config 3		-12	-12	5	5	5
M	Config 1	dBm/15	-98				
$N_{oc}$ Config 1		KHz	-98				
Config 3			-98				
Propagation co	ondition		TDL-C 300ns 100Hz				
	NG shall be used such that th smitted power spectral densit					constant t	otal

- Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
- Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
- Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
- Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
- Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.4.5.5.1.1-1.
- Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause [A.3.6].

Table A.6.5.5.1.1-4: Measurement gap configuration for FR1 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode

Field	Test 1
rieid	Value
gapOffset	0

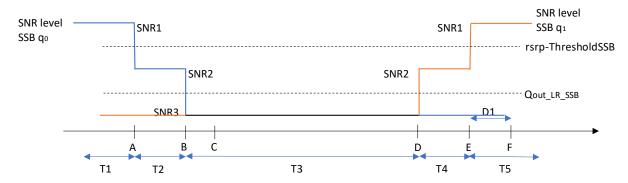


Figure A.6.5.5.1.1-1: SNR variation SSB for SSB-based beam failure detection and link recovery testing in non-DRX mode

#### A.6.5.5.1.2 Test Requirements

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q<sub>1</sub>.

No later than time point F occurring no later than D1 = [120+10] ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit preamble on a beam associated with the candidate beam set  $q_1$  earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

### A.6.5.5.2 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in DRX mode

#### A.6.5.5.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set  $q_0$  configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.6.5.5.2.1-1, A.6.5.5.2.1-2, A.6.5.5.2.1-3, A.6.5.5.2.1-4 and A.6.5.5.2.1-5 below. There is one cell, cell 1 which is the active cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.6.5.5.2.1-1 shows the variation of the downlink SNR of the SSB in set  $q_0$  in the active cell to emulate SSB based beam failure. Figure A.6.5.5.2.1-1 additionally shows the variation of the downlink SNR of the SSB in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [2] ms. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the

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

Table A.6.5.5.2.1-1: Supported test configurations for FR1 PCell

Confi	guration	Description		
1		FDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth		
2		TDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth		
3		TDD duplex mode, 30kHz SSB SCS, 40 MHz bandwidth		
Note: The UE is only required to pass in one of the supported test configurations in FR1				

Table A.6.5.5.2.1-2: General test parameters for FR1 PCell for SSB-based beam failure detection and link recovery testing in DRX mode

Parameter		Unit	Value	Comment
			Test 1	
			0 11.4	
Active PSCell			Cell 1	
RF Channel Number	0 5 4		1	
Duplex mode	Config 1		FDD	
BWchannel	Config 2, 3		TDD 50	
Byvchannel	Config 1	MHz	10: NRB,c = 52	
	Config 2		10: NRB,c = 52	
	Config 3		40: NRB,c = 106	
DL initial BWP configuration	Config 1, 2, 3		DLBWP.0.1	
DL dedicated BWP configuration	Config 1, 2, 3		DLBWP.1.1	
UL initial BWP configuration	Config 1, 2, 3		ULBWP.0.1	
UL dedicated BWP configuration	Config 1, 2, 3		ULBWP.1.1	
TDD Configuration	Config 1		Not Applicable	
	Config 2		TDDConf.1.1	
	Config 3		TDDConf.1.2	
CORESET Reference	Config 1		CR. 1.1 FDD	
Channel	Config 2		CR. 1.1 TDD	
	Config 3		CR. 2.1 TDD	
SSB Configuration	Config 1		SSB.3 FR1	
	Config 2		SSB.3 FR1	
	Config 3		SSB.4 FR1	
SMTC Configuration	Config 1, 2		SMTC.1	
	Config 3		SMTC.1	
PDSCH/PDCCH subcarrier	Config 1, 2		15 KHz	
spacing	Config 3		30 KHz	
PRACH Configuration Config 1, 2			Table A.3.8.2.4-1	
	Config 3		Table A.3.8.2.4-1	
SSB Index assigned as BFD			0	
SSB Index assigned as CBD	RS (q <sub>1</sub> )		1	
OCNG parameters			OP.1	

CP length			Normal	
Correlation Matrix and	Antenna		2x2 Low	
Configuration	7 tillollila		ZXZ ZOW	
Beam failure	DCI format		1-0	
detection	Number of Control		2	
transmission	OFDM symbols		_	
parameters	Aggregation level	CCE	8	
	Ratio of hypothetical	dB	0	
	PDCCH RE energy			
	to average CSI-RS			
	RE energy			
	Ratio of hypothetical	dB	0	
	PDCCH DMRS			
	energy to average			
	CSI-RS RE energy			
	DMRS precoder		REG bundle size	
	granularity			
	REG bundle size		6	
DRX			DRX.7	A.3.3.7
Gap pattern ID			N.A.	
rlmInSyncOutOfSyncT	hreshold		Absent	When the field is
				absent, the UE
				applies the value
				0. (Table 8.1.1-
TI 1 1100D		15	20	1).
rsrp-ThresholdSSB		dBm	-98	Threshold used
0 1 10% 100				for Qout_LR_SSB
powerControlOffsetSS			db0	Used for deriving
				rsrp- ThresholdCSI-
				RS
beamFailureInstanceM	layCount		n1	see clause 5.17
bealth andrenistancely	iaxCount		""	of TS 38.321 [7]
beamFailureDetection <sup>-</sup>	Timer		pbfd4	see clause 5.17
boarm anarobotoston			polar	of TS 38.321 [7]
CSI-RS configuration	Config 1, 4		[CSI-RS.1.1 FDD]	
for CSI reporting	., .		[0	
, ,	Config 2, 5		[CSI-RS.1.1 TDD]	
	Config 3, 6		[CSI-RS.2.1 TDD]	
CSI-RS for tracking	Config 1, 4		[TRS.1.1 FDD]	
_	Config 2, 5		[TRS.1.1 TDD]	
	Config 3, 6		[TRS.1.2 TDD]	
SSB Index assigned		0, 1		
as RLM RS				
T310 Timer	ms	1000		
N310		2		
T1		S	1	During this time
				the the UE shall
				be fully
				synchronized to
То			E 47	cell 1
T2 T3		S	5.17 3.24	
T4		S S	3.24 0	
T5			1.97	
D1		S S	1.93	
וט		_ s	1.33	<u> </u>

Note 1: All configurations are assigned to the UE prior to the start of time period T1.

Note 2: UE-specific PDCCH is not transmitted after T1 starts.

Table A.6.5.5.2.1-3: Cell specific test parameters for FR1 PCell for SSB-based beam failure detection and link recovery testing in DRX mode

Parameter		Unit			Test 1			
		•	T1	T2	T3	T4	T5	
EPRE ratio of	PDCCH DMRS to SSS	dB						
EPRE ratio of	PDCCH to PDCCH DMRS	dB						
EPRE ratio of	PBCH DMRS to SSS	dB						
EPRE ratio of	PBCH to PBCH DMRS	dB						
EPRE ratio of	PSS to SSS	dB			0			
EPRE ratio of	PDSCH DMRS to SSS	dB						
EPRE ratio of PDSCH to PDSCH DMRS		dB						
EPRE ratio of	EPRE ratio of OCNG DMRS to SSS							
EPRE ratio of	OCNG to OCNG DMRS	dB						
SNR_SSB of	Config 1	dB	5	-3	-12	-12	-12	
set q <sub>0</sub>	Config 2		5	-3	-12	-12	-12	
	Config 3		5	-3	-12	-12	-12	
SNR SSB of	Config 1		-12	-12	5	5	5	
set q <sub>1</sub>	Config 2	dB	-12	-12	5	5	5	
Set q1	Config 3		-12	-12	5	5	5	
M	Config 1	dBm/15	-98					
$N_{oc}$	Config 2	KHz	-98					
Config 3				-98				
Propagation condition			TDL-C 300ns 100Hz					

- Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
- Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
- Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
- Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
- Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.4.5.5.1.1-1.
- Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause [A.3.6].

Table A.6.5.5.2.1-4: Void

Table A.6.5.5.2.1-5: Void

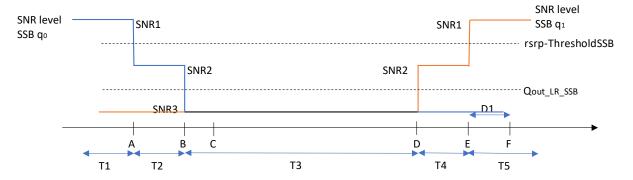


Figure A.6.5.5.2.1-1: SNR variation for SSB-based beam failure detection and link recovery testing in non-DRX mode

#### A.6.5.5.2.2 Test Requirements

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q<sub>1</sub>.

No later than time point F occurring no later than D1 = [1920+10] ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit preamble on a beam associated with the candidate beam set  $q_1$  earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## A.6.5.5.3 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with CSI-RS-based BFD and LR in non-DRX mode

#### A.6.5.5.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set  $q_0$  configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candicate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR1 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.6.5.5.3.1-1, A.6.5.5.3.1-2, and below. There is one cell, cell 1 which is the active cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.6.5.5.3.1-1 shows the variation of the downlink SNR of the CSI-RS in set  $q_0$  in the active cell to emulate CSI-RS based beam failure. Figure A.6.5.5.3.1-1 additionally shows the variation of the downlink SNR of the CSI-RS in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [2] ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements without gaps.

Table A.6.5.5.3.1-1: Supported test configurations for FR1 PCell

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

Table A.6.5.5.3.1-2: General test parameters for FR1 PCell for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode

Parameter		Unit	Value Test 1	Comment
			10011	
Active PCell			Cell 1	
RF Channel Nui	mber		1	
Duplex mode	Config 1		FDD	
	Config 2, 3		TDD	
TDD	Config 1		Not Applicable	
Configuration	Config 2		TDDConf.1.1	
-	Config 3		TDDConf.1.2	
CORESET	Config 1		CR.1.1 FDD	A.3.1.2
Reference	Config 2		CR.1.1 TDD	
Channel	Config 3		CR.2.1 TDD	
SSB	Config 1		SSB.1 FR1	A.3.10
Configuration	Config 2		SSB.1 FR1	
J = 1g = 1	Config 3		SSB.2 FR1	
SMTC	Config 1, 2		SMTC.1	A.3.11
Configuration	Config 3		SMTC.1	71.0.11
PDSCH/PDC	Config 1, 2		15 KHz	
CH subcarrier	•			
spacing	Config 3		30 KHz	
csi-RS-Index as	signed as beam		0	
failure detection	RS in set q₀			
OCNG paramete	ers		OP.1	A.3.2.1
CP length			Normal	
Correlation Matr	rix and Antenna		2x2 Low	
Configuration				
Beam failure	DCI format		1-0	
detection	Number of Control		2	
transmission	OFDM symbols			
parameters	Aggregation level	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0	
	DMRS precoder granularity		REG bundle size	
	REG bundle size		6	
DRX			OFF	
Gap pattern ID			N.A.	
	signed as candidate		1	N

rlmInSyncOutOfSyncThree		absent	When the field is absent, the UE applies the value 0. (Table 8.1.1-1).	
rsrp-ThresholdSSB		dBm	-98	Threshold used for Q <sub>in_LR_SSB</sub>
powerControlOffsetSS			db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMax(	Count		n1	see clause 5.17 of TS 38.321 [7]
beamFailureDetectionTime	er		pbfd4	see clause 5.17 of TS 38.321 [7]
CSI-RS configuration for	Config 1		CSI-RS.1.2 FDD	A.3.14
q <sub>0</sub> and q <sub>1</sub>	Config 2		CSI-RS.1.2 TDD	
	Config 3		CSI-RS.2.2 TDD	
CSI-RS configuration for	Config 1		CSI-RS.1.1 FDD	A.3.14
CSI reporting	Config 2		CSI-RS.1.1 TDD	
	Config 3		CSI-RS.2.1 TDD	
TRS configuration	Config 1		TRS.1.1 FDD	
	Config 2		TRS.1.1 TDD	
	Config 3		TRS.1.2 TDD	
CSI-RS-Index assigned	Config 1		CSI-RS.1.2 FDD	A.3.14
as RLM RS	Config 2		CSI-RS.1.2 TDD	
	Config 3		CSI-RS.2.2 TDD	
T310 Timer		ms	1000	
N310			2	
T1		S	0.2	During this time the the UE shall be fully synchronized to cell 1
T2	S	0.18		
T3	S	0.14		
T4	S	0		
T5	S	0.08		
D1		S	0.04	
Note 1: UE-specific PD	CCH is not tra	ansmitted af	er T1 starts.	

Table A.6.5.5.3.1-3: Cell specific test parameters for FR1 PCell for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode

Parameter		Unit			Test 1		
			T1	T2	Т3	T4	T5
EPRE ratio of PDC	CH DMRS to SSS	dB			•		
EPRE ratio of PDC	CH to PDCCH DMRS	dB					
EPRE ratio of PBC	H DMRS to SSS	dB					
EPRE ratio of PBC	H to PBCH DMRS	dB					
EPRE ratio of PSS	to SSS	dB			0		
EPRE ratio of PDS	CH DMRS to SSS	dB					
EPRE ratio of PDS	CH to PDSCH DMRS	dB					
EPRE ratio of OCN	G DMRS to SSS	dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
SNR_CSI-RS of	Config 1		5	-3	-12	-12	-12
set q <sub>0</sub>	Config 2	dB	5	-3	-12	-12	-12
	Config 3		5	-3	-12	-12	-12

SNR_CSI-RS of		Config 1		-12	-12	5	5	5
		Config 2	dB	-12	-12	5	5	5
set q <sub>1</sub>		Config 3		-12	-12	5	5	5
λΙ		Config 1	dBm/15	dBm/15 -98 KHz -98				
$N_{oc}$		Config 2	KHz					
	Config 3			-98				
Propagation condition				TDL-C 300ns 100Hz				
Note 1:	OCNG s	hall be used such t	hat the resources	in Cell 1 a	re fully allo	cated and a	a constant to	otal
	transmitt	ted power spectral	density is achieve	d for all OF	DM symbo	ls.		
Note 2:	The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.							
Note 3:	NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start							
	of time period T1.							
Note 4:	Measurement gap configuration is assigned to the UE prior to the start of time period T1							

- Measurement gap configuration is assigned to the UE prior to the start of time period T1.
- Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period
- The signal contains PDCCH for UEs other than the device under test as part of OCNG. Note 6:
- SNR levels correspond to the signal to noise ratio over the SSS REs. Note 7:
- Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.4.5.5.1.1-1.
- The SNR values are specified for testing a UE which supports 2RX on at least one band. For Note 9: testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause [A.3.6].

## Table A.6.5.5.3.1-4: Void Table A.6.5.5.3.1-5: Void

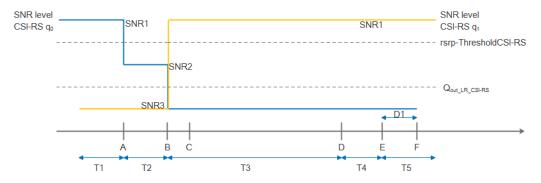


Figure A.6.5.5.3.1-1: SNR variation for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode

#### A.6.5.5.3.2 **Test Requirements**

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the shall detect beam failure and initiat link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q<sub>1</sub>.

No later than time point F occurring no later than D1 = [30+10] ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set q<sub>1</sub>. The UE shall not transmit preamble on a beam associated with the candidate beam set  $q_1$  earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## A.6.5.5.4 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with CSI-RS-based BFD and LR in DRX mode

#### A.6.5.5.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set q<sub>0</sub> configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candicate set q<sub>1</sub>. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR1 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.6.5.5.4.1-1, A.6.5.5.4.1-2, A.6.5.5.4.1-3, and A.6.5.5.4.1-4 below. There is one cell, cell 1 which is the active cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.6.5.5.4.1-1 shows the variation of the downlink SNR of the CSI-RS in set  $q_0$  in the active cell to emulate CSI-RS based beam failure. Figure A.6.5.5.4.1-1 additionally shows the variation of the downlink SNR of the CSI-RS in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [2] ms. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

Table A.6.5.5.4.1-1: Supported test configurations for FR1 PCell

Co	nfiguration	Description		
1		FDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth		
2		TDD duplex mode, 15 kHz SSB SCS, 10 MHz bandwidth		
3		TDD duplex mode, 30 kHz SSB SCS, 40 MHz bandwidth		
Note: The UE is only required to pass in one of the supported test configurations in FR1				

Table A.6.5.5.4.1-2: General test parameters for FR1 PCell for CSI-RS-based beam failure detection and link recovery testing in DRX mode

Pa	arameter	Unit	Value	Comment
			Test 1	
Active PCell			Cell 1	
RF Channel Num	ber		1	
Duplex mode	Config 1		FDD	
	Config 2, 3		TDD	
TDD	Config 1		Not Applicable	
Configuration	Config 2		TDDConf.1.1	
	Config 3		TDDConf.1.2	
CORESET	Config 1		CR.1.1 FDD	A.3.1.2
Reference	Config 2		CR.1.1 TDD	
Channel	Config 3		CR.2.1 TDD	
SSB	Config 1		SSB.1 FR1	A.3.10
Configuration	Config 2		SSB.1 FR1	
	Config 3		SSB.2 FR1	
SMTC	Config 1, 2		SMTC.1	A.3.11
Configuration	Config 3		SMTC.1	
	Config 1, 2		15 KHz	

PDSCH/PDCC	Config 3		30 KHz	
H subcarrier				
spacing				
csi-RS-Index assi	gned as beam failure		[0]	
detection RS in se				
OCNG parameter	'S		OP.1	A.3.2.1
CP length			Normal	
Correlation Matrix	and Antenna		2x2 Low	
Configuration				
Beam failure	DCI format		1-0	
detection	Number of Control		2	
transmission	OFDM symbols			
parameters	Aggregation level	CCE	8	
	Ratio of hypothetical	dB	0	
	PDCCH RE energy to			
	average CSI-RS RE			
	energy			
	Ratio of hypothetical	dB	0	
	PDCCH DMRS	uБ	U	
	energy to average			
	CSI-RS RE energy			
	DMRS precoder		REG bundle size	
	granularity			
	REG bundle size		6	
DRX			DRX.7	A.3.3.7
Gap pattern ID			N.A.	
csi-RS-Index assi	gned as candidate		1	
beam detection R				
rlmInSyncOutOfS			absent	When the field is
,				absent, the UE
				applies the value 0.
				(Table 8.1.1-1).
rsrp-ThresholdSS	В	dBm	-98	Threshold used for
'				Qin_LR_SSB
powerControlOffs	etSS		db0	Used for deriving
•				rsrp-ThresholdCSI-
				RS
beamFailureInsta	nceMaxCount		n1	see clause 5.17 of
boarm andromota	Hoomaxooant			TS 38.321 [7]
beamFailureDete	ctionTimer		pbfd4	see clause 5.17 of
bearin andrebete	odominio		рыч	TS 38.321 [7]
CSI-RS	Config 1		CSI-RS.1.2 FDD	A.3.14
configuration for	Config 2		CSI-RS.1.2 TDD	.1
q <sub>0</sub> and q <sub>1</sub>	Config 3	+		. !
			CSI-RS.2.2 TDD	A O 444
CSI-RS	Config 1		CSI-RS.1.1 FDD	A.3.14.1
configuration for	Config 2		CSI-RS.1.1 TDD	
CSI reporting	Config 3		CSI-RS.2.1 TDD	
TRS	Config 1		TRS.1.1 FDD	
configuration	Config 2		TRS.1.1 TDD	
	Config 3		TRS.1.2 TDD	
CSI-RS-Index	Config 1		CSI-RS.1.2 FDD	
assigned as	Config 2	1	CSI-RS.1.2 TDD	1
RLM RS	Config 3	1	CSI-RS.2.2 TDD	
T310 Timer		ms	1000	
N310		1110	2	
T1		S	1	During this time the
' '		3	'	the UE shall be
				fully synchronized
				to cell 1
TO			Q 27	IO CEII I
T2		S	8.37	

T3	S	6.44		
T4	S	0		
T5	S	1.97		
D1	S	1.93		
Note 1: UE-specific PDCCH is not transmitted after T1 starts.				

Table A.6.5.5.4.1-3: Cell specific test parameters for FR1 PCell for CSI-RS-based beam failure detection and link recovery testing in DRX mode

Parameter		Unit	Test 1				
			T1	T2	T3	T4	T5
EPRE ratio of PDCCH DM	RS to SSS	dB					
EPRE ratio of PDCCH to P	DCCH DMRS	dB					
EPRE ratio of PBCH DMR	S to SSS	dB					
EPRE ratio of PBCH to PB	CH DMRS	dB					
EPRE ratio of PSS to SSS		dB			0		
EPRE ratio of PDSCH DM	RS to SSS	dB					
EPRE ratio of PDSCH to P	DSCH DMRS	dB					
EPRE ratio of OCNG DMR	S to SSS	dB					
EPRE ratio of OCNG to OC	CNG DMRS	dB					
SNR_CSI-RS of set q <sub>0</sub>	Config 1		5	-3	-12	-12	-12
	Config 2	dB	5	-3	-12	-12	-12
	Config 3		5	-3	-12	-12	-12
	Config 1		-12	-12	5	5	5
SNR_CSI-RS of set q <sub>1</sub>	Config 2	dB	-12	-12	5	5	5
	Config 3		-12	-12	5	5	5
$N_{oc}$	Config 1	dBm/15			-98		
Config 2		KHz	-98				
Config 3					-98		
Propagation condition			TDL-C 300ns 100Hz				

- Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
- Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
- Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
- Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
- Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.4.5.5.1.1-1.
- Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause [A.3.6].

Table A.6.5.5.4.1-4: Void

Table A.6.5.5.4.1-5: Void

Table A.6.5.5.4.1-6: Void

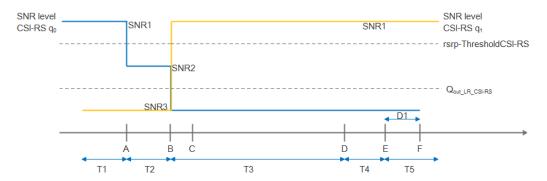


Figure A.6.5.5.4.1-1: SNR variation for CSI-RS-based beam failure detection and link recovery testing in DRX mode

#### A.6.5.5.4.2 Test Requirements

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the shall detect beam failure and initiat link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q<sub>1</sub>.

No later than time point F occurring no later than D1 = [1920+10] ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit preamble on a beam associated with the candidate beam set  $q_1$  earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

#### A 6 5 6 Active BWP switch

#### A.6.5.6.1 DCI-based and Timer-based Active BWP Switch

## A.6.5.6.1.1 NR FR1- NR FR1 DL active BWP switch of PCell with non-DRX in SA

#### A.6.5.6.1.1.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement defined in clause 8.6, and interruption requirement on other active serving cell defined in clause 8.2.2.2.5.

The supported test configurations are shown in Table A.6.5.6.1.1.1-1 below. The test scenario comprises of one NR PCell (Cell 1) and one NR SCell (Cell 2) as given in Table A.6.5.6.1.1.1-2. NR Cell-specific parameters is specified in Table A.6.5.6.1.1.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 1 and the time duration of T2.

PDCCHs indicating new transmissions shall be sent continuously on SCell (Cell 2) to ensure that the UE will have ACK/NACK sending.

Before the test starts.

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), and Cell 2 (SCell) on radio channel 2 (SCC).

- UE is configured with 2 different UE-specific downlink bandwidth parts for PCell, BWP-1 and BWP-2, in Cell 1 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.
- UE is indicated in firstActiveDownlinkBWP-Id that the active DL BWP is BWP-1 in PCell.
- UE is configured with a *bwp-InactivityTimer* timer value for PCell.

All cells have constant signal levels throughout the test.

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

#### During T1,

Time period T1 starts when a DCI format 1\_1 command for PCell DL BWP switch, sent from the test equipment to the UE, is received at the UE side in PCell's slot # denoted i. The UE shall switch its bandwidth part from BWP-1 to BWP-2.

The UE shall be able to receive PDSCH no later than the beginning of the DL slot right after PCell's DL slot  $(i+T_{BWPswitchDelay})$  as defined in clause 8.6 and starts to report valid ACK/NACK for the PCell no later than the beginning of the DL slot right after slot  $(i+T_{BWPswitchDelay}+kI)$ . The UE shall be continuously scheduled on PCell's BWP-2 no later than the beginning of the DL slot right after slot  $(i+T_{BWPswitchDelay})$ .

The starting time of SCell (Cell 2) interruption due to BWP switch on PCell shall occur within the BWP switch delay.

During T2, the test equipment won't transmit DCI format for PDSCH reception on PCell(Cell 1).

#### During T3,

The time period T3 starts from the slot #j, where j is the beginning slot of the DL subframe immediately after the slot wherein *bwp-InactivityTimer* timer expires. The UE should switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1.

The UE shall be able to receive PDSCH no later than the beginning of the DL slot right after PCell's slot  $(j+T_{BWPswitchDelay})$  as defined in clause 8.6 and starts to report valid ACK/NACK for the SCell at latest at the beginning of the DL slot right after slot  $(j+T_{BWPswitchDelay}+kI)$ . The UE shall be continuously scheduled on SCell's BWP-1 no later than the beginning of the DL slot right after slot  $(j+T_{BWPswitchDelay})$ .

The starting time of SCell (Cell 2) interruption due to BWP switch of PCell shall occur within the BWP switch delay.

The test equipment verifies the DL BWP switch time in PCell by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK is received.

The test equipment verifies that potential interruption to SCell is carried out in the correct time span by monitoring ACK/NACK sent in SCell during BWP switch of PCell, respectively.

Table A.6.5.6.1.1.1-1: DL BWP switch supported test configurations

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

Table A.6.5.6.1.1.1-2: General test parameters for DL BWP switch in SA

Parameter	Unit	Value	Comment
NR RF Channel Number		2	Two NR radio channel is used for this test
Active PCell		Cell 1	PCell on RF channel number 1.
Active SCell		Cell 2	SCell on RF channel number 2.
CP length		Normal	
DRX		OFF	For both PCell and SCell
bwp-InactivityTimer	ms	[200	
Cell-individual offset for cells on RF channel number 1	dB	0	Individual offset for cells on PCC.
Cell-individual offset for cells on RF channel number 2	dB	0	Individual offset for cells on SCC.
Cell2 timing offset to cell1	μs	3	Time alignment error as specified in TS 38.104 [13] clause 6.5.3.1.
T1	S	0.2	
T2	S	0.2	
T3	S	0.2	

Table A6.5.6.1.1.1-3: NR Cell specific test parameters for DL BWP switch in SA

Parame	Parameter		Cell 1	Cell2
Frequency Range			FR1	FR1
Duplex mode	Config 1		FDD	FDD
	Config 2,5		TDD	TDD
	Config 3		TDD	FDD
	Config 4		FDD	TDD
TDD configuration	Config 1		Not Applicable	Not Applicable
	Config 2		TDDConf.1.1	TDDConf.1.1
	Config 3		TDDConf.1.1	Not Applicable
	Config 4		Not Applicable	TDDConf.1.1
	Config 5		TDDConf.1.2	TDDConf.1.2
BW <sub>channel</sub>	Config 1,2,3,4		10 MHz: N <sub>RB,c</sub> = 52	10 MHz: N <sub>RB,c</sub> = 52
	Config 5		40 MHz: N <sub>RB,c</sub> = 106	40 MHz: N <sub>RB,c</sub> = 106
Active BWP ID			1, 2	3
Initial BWP Configuration			DLBWP.0.2 <sup>Note4</sup>	
Active BWP-1 Configura	tion		DLBWP.1.1 <sup>Note4</sup>	-
Active BWP-2 Configura	tion		DLBWP.1.3 <sup>Note4</sup>	-
PDSCH Reference	Config 1		SR.1.1 FDD	SR.1.1 FDD
measurement channel	Config 2		SR.1.1 TDD	SR.1.1 TDD
	Config 3		SR.1.1 TDD	SR.1.1 FDD
	Config 4		SR.1.1 FDD	SR.1.1 TDD
	Config 5		SR.2.1 TDD	SR.2.1 TDD
RMSI CORESET	Config 1		CR.1.1 FDD	CR.1.1 FDD
parameters	Config 2		CR.1.1 TDD	CR.1.1 TDD
	Config 3		CR.1.1 TDD	CR.1.1 FDD
	Config 4		CR.1.1 FDD	CR.1.1 TDD
	Config 5		CR.2.1 TDD	CR.2.1 TDD
Dedicated CORESET	Config 1		CCR.1.1 FDD	CCR.1.1 FDD
parameters	Config 2	]	CCR.1.1 TDD	CCR.1.1 TDD
	Config 3		CCR.1.1 TDD	CCR.1.1 FDD
	Config 4		CCR.1.1 FDD	CCR.1.1 TDD
	Config 5		CCR.2.1 TDD	CCR.2.1 TDD
OCNG Patterns	<u>,                                      </u>			P.1
SSB Configuration	SSB Configuration Config 1,2,3,4		SSB.1 FR1	
	Config 5		SSB.:	2 FR1

SMTC Configuration			SMTC.1	
Correlation Matrix ar	nd Antenna		1x2 Low	
Configuration				
EPRE ratio of PSS t	o SSS	dB		
EPRE ratio of PBCH	I DMRS to SSS			
EPRE ratio of PBCH	I to PBCH DMRS			
EPRE ratio of PDCC	CH DMRS to SSS			
EPRE ratio of PDCC	CH to PDCCH DMRS			
EPRE ratio of PDSC	H DMRS to SSS		0	0
EPRE ratio of PDSC	H to PDSCH			
EPRE ratio of OCNO	G DMRS to SSS(Note			
1)	·			
EPRE ratio of OCNO	6 to OCNG DMRS			
(Note 1)				
Noc <sup>Note 2</sup>	Config 1,2,3,4	dBm/SCS	[-104	[-104
	Config 5		[-110	[-110
Noc <sup>Note 2</sup>		dBm/15KH	[-104	[-104
		Z	-	-
SS-RSRP Note 3	Config 1,2,3,4	dBm/SCS	[-87	[-87
	Config 5		[-90	[-90
Ê <sub>s</sub> /I <sub>ot</sub>		dB	[17	[17
Ês/Noc		dB	[17	[17
Io <sup>Note3</sup> Config 1,2,3,4		dBm/ 9.36MHz	[-59	[-59
Config 5		dBm/ 38.16MHz	[-61.9	[-61.9
Propagation Condition			AWGN	AWGN
Note 1: OCNG sh density is	all be used such that be achieved for all OFDM	symbols.	vallocated and a constant total to ot specified in the test is assum	

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

Note 3 SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3].

#### A.6.5.6.1.1.2 Test Requirements

During T1, the UE shall start to send the ACK for PSCell in the DL slot right after DL slot  $(i+T_{BWPswitchDelay}+kI)$ .

During T3, the UE shall start to send the ACK for PSCell in the DL slot right after DL slot  $(j+T_{BWPswitchDelav}+kI)$ .

Where, k1 is the timing between DL data receiving and acknowledgement as specified in [7].

Depending on UE capability *bwp-SwitchingDelay* [2], UE shall finish BWP switch within the time duration  $T_{BWPswitchDelay}$  defined in Table 8.6.2-1.

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch delay to be counted as correct.

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

During T1 and T3, the start time of SCell interruption during PCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of SCell shall not be longer than the interruption duration specified for active BWP switch in clause 8.2.2.2.5.

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch interruption to be counted as correct.

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

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK in the DL slot right after DL slot  $(i+T_{BWPswitchDelay}+kI)$ ,  $(j+T_{BWPswitchDelay}+kI)$ , then the UE shall use the next available uplink resource for reporting the corresponding ACK.

#### A.6.5.6.1.2 NR FR1 DL active BWP switch with non-DRX in SA

#### A.6.5.6.1.2.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement defined in clause 8.6. Supported test configurations are shown in Table A.6.5.6.1.2.1-1.

The test scenario comprises of one NR cell (Cell 1) as given in Table A.6.5.6.1.2.1-2. Cell-specific parameters of the NR cell are specified in Table A.6.5.6.1.2.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on Cell 1 to ensure that the UE will have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 on radio channel 1.
- UE is configured with 2 different UE-specific downlink bandwidth parts, BWP-1 and BWP-2 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1.
- UE is configured with a *bwp-InactivityTimer* timer value for Cell1.

All cells have constant signal levels throughout the test.

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

During T1,

Time period T1 starts when a DCI format 1\_1 command for DL BWP switch, sent from the test equipment to the UE, is received at the UE side in Cell1's slot # denoted i. The UE shall switch its bandwidth part from BWP-1 to BWP-2.

The UE shall be able to receive PDSCH at the beginning of the DL slot right after Cell1's DL slot  $(i+T_{BWPswitchDelay})$  as defined in clause 8.6 and starts to report valid ACK/NACK for the Cell1 no later than the beginning of the DL slot right after slot  $(i+T_{BWPswitchDelay}+kI)$ . The UE shall be continuously scheduled on Cell1's BWP-2 starting from the beginning of the DL slot right after slot  $(i+T_{BWPswitchDelay})$ .

During T2, the test equipment won't transmit DCI format for PDSCH reception on Cell1.

#### During T3,

The time period T3 starts from the slot #j, where j is the beginning slot of the DL subframe immediately after the slot wherein bwp-InactivityTimer timer expires. The UE shall switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1.

The UE shall be able to receive PDSCH at the beginning of the DL slot right after Cell1's slot  $(j+T_{BWPswitchDelay})$  as defined in clause 8.6 and starts to report valid ACK/NACK for the Cell1 at latest at the beginning of the DL slot right after slot  $(j+T_{BWPswitchDelay}+kI)$ . The UE shall be continuously scheduled on Cell1's BWP-1 starting from the beginning of the DL slot right after slot  $(j+T_{BWPswitchDelay})$ .

The test equipment verifies the DL BWP switch time by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK is received.

Table A.6.5.6.1.2.1-1: DL BWP switch supported test configurations

	Config	Description			
1		NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode			
2		NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode			
3		NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode			
Note 1:	ote 1: The UE is only required to be tested in one of the supported test configurations.				
Note 2:	· ·				

Table A.6.5.6.1.2.1-2: General test parameters for DL BWP switch in SA

Parameter	Unit	Value	Comment
NR RF Channel Number		1	One NR radio channel is used for this test
Active Cell		Cell 1	Cell1 on RF channel number 1.
CP length		Normal	
DRX		OFF	
bwp-InactivityTimer	ms	[200]	
T1	S	[0.2]	
T2	S	[0.2]	
T3	S	[0.2]	

Table A.6.5.6.1.2.1-3: NR Cell specific test parameters for DL BWP switch in SA

Parame	ter	Unit	Cell 2
Frequency Range			FR1
Duplex mode	Config 1		FDD
	Config 2,3		TDD
TDD configuration	Config 1		Not Applicable
	Config 2		TDDConf.1.1
	Config 3		TDDConf.1.2
BW <sub>channel</sub>	Config 1		10 MHz: N <sub>RB,c</sub> = 52
	Config 2		10 MHz: N <sub>RB,c</sub> = 52
	Config 3		40 MHz: N <sub>RB,c</sub> = 106
Active BWP ID			1, 2
Initial DL BWP	Config 1 2 2		
Configuration	Config 1,2,3		DLBWP.0.2 Note 4
Active DL BWP-1	Config 1 2 3		
Configuration	Config 1,2,3		DLBWP.1.1 Note 4
Active DL BWP-2	Config 1,2,3		
Configuration	Cornig 1,2,3		DLBWP.1.3 Note 4
Initial UL BWP	Config 1,2,3		
Configuration	Cornig 1,2,3		ULBWP.0.2 Note 4
Active UL BWP-1	Config 1,2,3		
Configuration	Cornig 1,2,0		ULBWP.1.1 Note 4
Active UL BWP-2	Config 1,2,3		
Configuration			ULBWP.1.3 Note 4
PDSCH Reference	Config 1		SR.1.1 FDD
measurement channel	Config 2		SR.1.1 TDD
	Config 3		SR.2.1 TDD
RMSI CORESET	Config 1		CR.1.1 FDD
parameters	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
Dedicated CORESET	Config 1		CCR.1.1 FDD
parameters	Config 2		CCR.1.1 TDD
	Config 3		CCR.2.1 TDD

OCNG Patterns			OP.1		
SSB Configuration	Config 1,2		SSB.1 FR1		
_	Config 3		SSB.2 FR1		
SMTC Configuration			SMTC.1		
Correlation Matrix and	d Antenna		1x2 Low		
Configuration					
TRS Configuration			TRS.1.1 FDD		
	Config 2,5		TRS.1.1 TDD		
	Config 3,6		TRS.1.2 TDD		
EPRE ratio of PSS to	SSS	dB	0		
EPRE ratio of PBCH	DMRS to SSS				
EPRE ratio of PBCH	to PBCH DMRS				
EPRE ratio of PDCCH	H DMRS to SSS				
EPRE ratio of PDCCI	to PDCCH DMRS				
EPRE ratio of PDSCH	I DMRS to SSS				
EPRE ratio of PDSCH	H to PDSCH				
EPRE ratio of OCNG	DMRS to SSS(Note				
1)	•				
EPRE ratio of OCNG	to OCNG DMRS				
(Note 1)					
Noc <sup>Note 2</sup>	Config 1,2	dBm/SCS	[-104]		
	Config 3		[-101]		
Noc <sup>Note 2</sup>		dBm/15kH	[-104]		
		z			
SS-RSRP Note 3	Config 1,2	dBm/SCS	[-87]		
	Config 3		[-90]		
Ê <sub>s</sub> /I <sub>ot</sub>		dB	[17]		
Ês/Noc		dB	[17]		
Io <sup>Note3</sup>	Config 1,2	dBm/ 9.36MHz	[-59]		
	Config 3	dBm/ 38.16MHz	[-61.9]		
Propagation Condition	n .		AWGN		
		oth cells are full	y allocated and a constant		
total transmitted power spectral density is achieved for all OFDM symbols.					
Note 2: Interference from other cells and noise sources not specified in the test is					
assumed to	ne and shall be modelled as				
	appropriate power for I				
	and lo levels have bee				
information purposes. They are not settable parameters themselves.					
			an UL BWP. DLBWP.0.2 is		
linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3					
linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3].					

#### A.6.5.6.1.2.2 Test Requirements

During T1, the UE shall start to send the ACK for Cell1 in the DL slot right after DL slot  $(i+T_{BWPswitchDelay}+kI)$ .

During T3, the UE shall start to send the ACK for Cell1 in the DL slot right after DL slot  $(j+T_{BWPswitchDelay}+kI)$ .

Where, kI is the timing between DL data receiving and acknowledgement as specified in [7].

Depending on UE capability *bwp-SwitchingDelay* [2], UE shall finish BWP switch within the time duration  $T_{BWPswitchDelay}$  defined in Table 8.6.2-1.

All of the above test requirements shall be fulfilled in order for the observed PSCell active BWP switch delay to be counted as correct.

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

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK in the DL slot right after DL slot  $(i+T_{BWPswitchDelay}+kI)$ ,  $(j+T_{BWPswitchDelay}+kI)$ , then the UE shall use the next available uplink resource for reporting the corresponding ACK.

#### A.6.5.6.2 RRC-based Active BWP Switch

#### A.6.5.6.2.1 NR FR1- NR FR1 DL active BWP switch of PCell with non-DRX in SA

#### A.6.5.6.2.1.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement for RRC-based BWP switch defined in clause 8.6. Supported test configurations are shown in Table A.6.5.6.2.1.1-1.

The test scenario comprises of one NR PCell (Cell 1) as given in Table A.6.5.6.2.1.1-2. Cell-specific parameters of NR PCell are specified in Table A.6.5.6.2.1.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC).
- UE has bandwidth part BWP-1 in its RRC-configuration for Cell 1 (PCell).
- UE is indicated in firstActiveDownlinkBWP-Id that the active DL BWP is BWP-1 in PCell.

All cells have constant signal levels throughout the test.

The test consists of 1 time period, with duration of T1.

#### During T1,

Time period T1 starts when a *RRCReconfiguration* with updated bandwidth part configuration, sent from the test equipment to the UE, is completely received at the UE side in PCell's slot # denoted i. The UE shall reconfigure its bandwidth part with the updated bandwidth part configuration.

The UE shall be able to receive PDSCH at the beginning of the DL slot right after PCell's DL slot ( $i+T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC}$ ) as defined in clause 8.6.3 and be ready for the reception of uplink grant for the PCell no later than at the beginning of the DL slot right after slot ( $i+T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC}$ ). The UE shall be continuously scheduled on PCell's BWP-1 starting from the beginning of the DL slot right after slot ( $i+T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC}$ ).

 $T_{RRCprocessingDelay}$  and  $T_{BWPswitchDelayRRC}$  are defined in clause 8.6.3.

The test equipment verifies the DL BWP switch time in PCell by counting the time from the time when the RRC Reconfiguration message including updated BWP configuration is sent till the time when RRC Reconfiguration Complete message is received.

Table A.6.5.6.2.1.1-1: DL BWP switch supported test configurations

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

Table A.6.5.6.2.1.1-2: General test parameters for DL BWP switch in synchronous EN-DC

Parameter	Unit	Value	Comment
NR RF Channel Number		1	One NR radio channel is used for this test
Active PCell		Cell 1	PCell on RF channel number 1.
CP length		Normal	
DRX		OFF	
Cell-individual offset for cells on RF channel number 1	dB	0	Individual offset for cells on PCC.
T1	S	[0.2]	

Table A.6.5.6.2.1.1-3: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC

Parameter			Unit	Cell 1
Frequency Rang	ge			FR1
Duplex mode		Config 1,4		FDD
		Config 2,3,5,6		TDD
TDD configuration	on	Config 1,4		Not Applicable
		Config 2,5		TDDConf.1.1
		Config 3,6		TDDConf.1.2
BW <sub>channel</sub>		Config 1,4		10 MHz: N <sub>RB,c</sub> = 52
		Config 2,5		10 MHz: N <sub>RB,c</sub> = 52
		Config 3,6		40 MHz: N <sub>RB,c</sub> = 106
Active BWP ID				1
Initial DL BWP		Config 1,4		DLBWP.0.2
Configuration		Config 2,5		
		Config 3,6		
Initial UL BWP		Config 1,4		ULBWP.0.2
Configuration		Config 2,5		
_		Config 3,6		
	tive DL	Config 1,4		DLBWP.1.3
	VP-1	Config 2,5		
ion		Config 3,6		
	tive UL	Config 1,4		ULBWP.1.3
	√P-1	Config 2,5		
Co	nfigurat	Config 3,6		
	tive DL	Config 1,4		DLBWP.1.1
_	√P-1	Config 2,5		
Co	nfigurat	Config 3,6		
Ac	tive UL	Config 1,4		ULBWP.1.1
	√P-1	Config 2,5		
Co	nfigurat	Config 3,6		
Initial UL BWP		Config 1,4		ULBWP.0.2
Configuration		Config 2,5		
_		Config 3,6		
Active UL BWP-	1	Config 1,4		ULBWP.1.3
Configuration		Config 2,5		
- ····g-····		Config 3,6		
Active UL BWP-	Active UL BWP-2			ULBWP.1.1
Configuration		Config 1,4 Config 2,5		
•		Config 3,6		
PDSCH Referen	nce	Config 1,4		SR.1.1 FDD
measurement ch		Config 2,5		SR.1.1 TDD
		Config 3,6		SR2.1 TDD
		Config 1,4		CR.1.1 FDD

DMCI COD	ГСГТ	Config 2,5		CR.1.1 TDD	
		Config 3,6		CR2.1 TDD	
Dedicated 0		Config 1,4		CCR.1.1 FDD	
parameters		Config 2,5		CCR.1.1 TDD	
		Config 3,6		CCR.2.1 TDD	
OCNG Patt				OP.1	
SSB Config	uration	Config 1,2,4,5		SSB.1 FR1	
		Config 3,6		SSB.2 FR1	
SMTC Conf	SMTC Configuration			SMTC.1	
TRS Config	uration	Config 1,4		TRS.1.1 FDD	
		Config 2,5		TRS.1.1 TDD	
		Config 3,6		TRS.1.2 TDD	
Antenna Co	nfiguration	, ,		1x2	
Propagation				AWGN	
	of PSS to SS	S	dB	0	
	of PBCH DMI			_	
	of PBCH to P				
	of PDCCH DI				
		PDCCH DMRS			
	of PDSCH DI				
	of PDSCH to				
EDDE ratio	of OCNC DM	RS to SSS <sup>(Note 1)</sup>			
EPRE Iallo	of OCNG DIVI	CNC DMDC(Note			
1)	EPRE ratio of OCNG to OCNG DMRS(Note				
NocNote 2			dBm/15	[-104]	
INOC	Nochote 2			[-104]	
SS-RSRPN	SS-RSRP Note 3			[-87]	
00-110111			dBm/15 kHz	[-01]	
Ês/Iot			dB	17	
Ês/Noc			dB	17	
lo <sup>Note3</sup>			dBm/	TBD	
10		Config 1,2,4,5	9.36MHz	166	
			dBm/	TBD	
		Config 3,6	38.16MHz	160	
Note 1: C	OCNG shall be	Luced cuch that hot		y allocated and a constant	
total transmitted power spectral density is achieved for all OFDM symbol Note 2: Interference from other cells and noise sources not specified in the test is					
				ne and shall be modelled	
		ppropriate power for			
Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.					
	Note 4: Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP.				
		linked with ULBWP			
ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause TS 38.213 [3].					
15 38.213 [3].					

#### A.6.5.6.2.2.2 Test Requirements

During T1, the UE shall be ready for the reception of uplink grant for PCell in the DL slot right after slot  $(i+T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC})$ .

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch delay to be counted as correct.

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

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

## A.6.6 Measurement procedure

## A.6.6.1 Intra-frequency Measurements

## A.6.6.1.1 SA event triggered reporting tests without gap under non-DRX

### A.6.6.1.1.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clauses 9.2.5.1 and 9.2.5.2.

## A.6.6.1.1.2 Test parameters

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for PCell and neighbour cell are given in Table A.6.6.1.1.1-1 and A.6.6.1.1.1-2 below. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

Table A.6.6.1.1.1.2-1: Supported test configurations

Coi	nfiguration	Description				
1		15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode				
2		15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode				
3		30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode				
Note:	Note: The UE is only required to be tested in one of the supported test configurations.					

Table A.6.6.1.1.2-2: General test parameters for SA intra-frequency event triggered reporting without gap for FR1

Parameter	Unit	Test	Value	Comment
		configur ation		
Active cell		1, 2, 3	Cell 1	
Neighbour cell		1, 2, 3	Cell 2	Cell to be identified.
RF Channel Number		1, 2, 3	1: Cell 1 and Cell 2	
SSB configuration		1	SSB.1 FR1	
		2	SSB.1 FR1	
		3	SSB.2 FR1	
SMTC configuration		1	SMTC.2	
		2	SMTC.1	
		3	SMTC.1	
A3-Offset	dB	1, 2, 3	-4.5	
CP length		1, 2, 3	Normal	
Hysteresis	dB	1, 2, 3	0	
Time To Trigger	S	1, 2, 3	0	
Filter coefficient		1, 2, 3	0	L3 filtering is not used
DRX		1, 2, 3		OFF
Time offset between PCell		1, 2, 3	3 μs	Synchronous EN-DC
and PSCell				
Time offset between serving		1	3 ms	Asynchronous cells.
and neighbour cells				The timing of Cell 3 is 3ms later
				than the timing of Cell 2.
		2	3 μs	Synchronous cells
		3	3 μs	Synchronous cells

T1	S	1, 2, 3	5	
T2	S	1, 2, 3	5	

Table A.6.6.1.1.2-3: NR Cell specific test parameters for SA intra-frequency event triggered reporting without gap for FR1

Parameter	Unit	Test	Cell 1		Ce	Cell 2		
		configuration	T1	T2	T1	T2		
TDD configuration		1		I/A		I/A		
		2		onf.1.1	TDDC			
		3		onf.2.1	TDDC			
PDSCH RMC		1		1 FDD	N.	/A		
configuration		2	SR.1.	1 TDD				
		3	SR.2.	1 TDD	]			
RMSI CORESET		1	CR.1.	1 FDD	CR.1.	1 FDD		
RMC		2	CR.1.	1 TDD	CR.1.	1 TDD		
configuration		3	CR.2.	1 TDD	CR.2.	1 TDD		
Dedicated		1	CCR.1	.1 FDD	CCR.1	.1 FDD		
CORESET RMC		2	CCR.1	.1 TDD	CCR.1	.1 TDD		
configuration		3	CCR.2	.1 TDD	CCR.2	.1 TDD		
OCNG Patterns		1, 2, 3	OF	P.1	OF	P.1		
TRS		1	TRS.1	.1 FDD	N.	/A		
Configuration		2		.1 TDD	N.	/A		
		3		.2 TDD		/A		
Ilnitial BWP		1, 2, 3	DLBV	VP.0.1	DLBV	VP.0.1		
configuration				VP.0.1		BWP.0.1		
Active DL BWP		1, 2, 3	DLBV	VP.1.1	DLBV	DLBWP.1.1		
configuration								
Active UL BWP		1, 2, 3	ULBV	VP.1.1	ULBV	VP.1.1		
configuration		4.0.0	0.0	20	0.0	25		
RLM-RS	-ID /000	1, 2, 3	S	SB		SB		
$N_{oc}$ Note 2	dBm/SCS	1			98			
		2			98			
	15 (45)	3			·95			
$N_{oc}$ Note 2	dBm/15 kHz	1		-	.98			
		2						
^ /	dB	3	4	-1.46	India:	-1.46		
$\hat{E}_{s}/I_{ot}$	Ф	1	4	-1.40	-Infinity	-1.46		
37 01		2 3	-					
2 /	dB	<u>3</u> 1	4	4	-Infinity	4		
$\hat{E}_s/N_{oc}$	uБ	2	<del>- 4</del>	4	-irillility	4		
		3						
SS-RSRP Note 3	dBm/SCS kHz	<u>3</u> 1	-94	-94	-Infinity	-94		
00110111	GDIII/OOO KI IZ	2	-94	-94	-Infinity	-94		
		3	-91	-91	-Infinity	-91		
lo	dBm/9.36 MHz	<u>5</u> 1	-64.60	-62.25	64.60	-62.25		
	dBm/9.36 MHz	2	-64.60	-62.25	64.60	-62.25		
	dBm/38.16 MHz	3	-58.50	-56.16	58.50	-56.16		
	==coc	<u> </u>	00.00					

Propagat	Propagation		1, 2, 3	AWGN
Condition	7 7			
Note 1:	The reso	urces for uplink transi	mission are assigned	to the UE prior to the start of time period
	T2.			
Note 2:				specified in the test is assumed to be
	constant	over subcarriers and	time and shall be mo	delled as AWGN of appropriate power for
	$N_{oc}$ to (	oe fulfilled.		
Note 3:		P levels have been de ble parameters thems		meters for information purposes. They are

#### A.6.6.1.1.3 Test Requirements

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 800 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.6.6.1.2 SA event triggered reporting tests without gap under DRX

#### A.6.6.1.2.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clauses 9.2.5.1 and 9.2.5.2.

#### A.6.6.1.2.2 Test parameters

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for PCell are given in Table A.6.6.1.2.2-1, A.6.6.1.2.2-2 and A.6.6.1.2.2-3 below. In the measurement controlinformation, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

Table A.6.6.1.2.2-1: Supported test configurations

Co	nfiguration	Description			
1		15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode			
2		15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode			
3		30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode			
Note: The UE is only required to be tested in one of the supported test configurations.					

Table A.6.6.1.2.2-2: General test parameters for SA intra-frequency event triggered reporting without gap for PCell in FR1 with DRX

Parameter	Unit	Test configur	Va	lue	Comment
		ation	Test 1	Test 2	
Active cell		1, 2, 3	Cell 1		
Neighbour cell		1, 2, 3	Cell 2		Cell to be identified.
RF Channel Number		1, 2, 3	1: Cell 1 and	Cell 2	
SSB configuration		1	SSB.1 FR1		
		2	SSB.1 FR1		
		3	SSB.2 FR1		
SMTC configuration		1	SMTC.2		
		2	SMTC.1		
		3	SMTC.1		
A3-Offset	dB	1, 2, 3	-4.5		
CP length		1, 2, 3	Normal		
Hysteresis	dB	1, 2, 3	0		
Time To Trigger	S	1, 2, 3	0		
Filter coefficient		1, 2, 3	0		L3 filtering is not used
DRX		1, 2, 3	DRX.1	DRX.2	
Time offset between PCell and PSCell		1, 2, 3	3 μs		Synchronous EN-DC
Time offset between serving		1	3 μs		Synchronous cells
and neighbour cells		2	3 ms		Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		3	3 μs		Synchronous cells
T1	S	1, 2, 3	5		
T2	s	1, 2, 3	5	10	

Table A.6.6.1.2.2-3: NR Cell specific test parameters for SA intra-frequency event triggered reporting without gap for PCell in FR1 with DRX

Parameter	Unit	Test	Ce	Cell 1		II 2
		configuration	T1	T2	T1	T2
TDD configuration		1	TN	I/A	TN	I/A
		2	TDDC	onf.1.1	TDDC	onf.1.1
		3	TDDC	onf.2.1	TDDC	onf.2.1
PDSCH RMC		1	SR.1.	1 FDD	N/A	
configuration		2	SR.1.	1 TDD		
		3	SR.2.	1 TDD		
RMSI CORESET		1	CR.1.	1 FDD	CR.1.	1 FDD
RMC		2	CR.1.	CR.1.1 TDD		1 TDD
configuration		3	CR.2.	CR.2.1 TDD		1 TDD
Dedicated		1	CCR.1	.1 FDD	CCR.1	.1 FDD
CORESET RMC		2	CCR.1	CCR.1.1 TDD		.1 TDD
configuration		3	CCR.2.1 TDD		CCR.2.1 TDD	

OCNG Patterns		1, 2, 3	OF	P.1	OF	P.1	
TRS configuration		1	TRS.1	.1 FDD	N.	/A	
		2	TRS.1.1 TDD		N/	N/A	
		3	TRS.1	.2 TDD	N.	/A	
IInitial BWP		1, 2, 3	DLBV	VP.0.1	DLBW	/P.0.1	
configuration			ULBV	VP.0.1	ULBW	/P.0.1	
Active DL BWP configuration		1, 2, 3	DLBV	VP.1.1	DLBW	/P.1.1	
Active UL BWP configuration		1, 2, 3	ULBV	VP.1.1	ULBW	/P.1.1	
RLM-RS		1, 2, 3	SS	SB	SS	SB	
$N_{ac}$ Note 2	dBm/SCS	1		-	98		
TV oc		2		-	·98		
		3	-95				
M Note 2	dBm/15 kHz	1		-	98		
$N_{oc}^{}$ Note 2		2					
		3					
$\hat{E}_{s}/I_{ot}$	dB	1	4	-1.46	-Infinity	-1.46	
$\mathbf{L}_{\mathrm{s}}/1_{\mathrm{ot}}$		2					
		3					
$\hat{E}_s/N_{oc}$	dB	1	4	4	-Infinity	4	
$E_s/I_{oc}$		2					
		3					
SS-RSRP Note 3	dBm/SCS kHz	1	-94	-94	-Infinity	-94	
		2	-94	-94	-Infinity	-94	
		3	-91	-91	-Infinity	-91	
lo	dBm/9.36 MHz	1	-64.60	-62.25	64.60	-62.25	
	dBm/9.36 MHz	2	-64.60	-62.25	64.60	-62.25	
	dBm/38.16 MHz	3	-58.50	-56.16	58.50	-56.16	
Propagation Condition		1, 2, 3	AWGN				

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2

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

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

## A.6.6.1.2.3 Test Requirements

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 6400 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.6.6.1.3 SA event triggered reporting tests with per-UE gaps under non-DRX

#### A.6.6.1.3.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clause 9.2.6.2 and 9.2.6.3.

#### A.6.6.1.3.2 Test parameters

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for PCell are given in Table A.6.6.1.3.1-1 and A.6.6.1.3.1-2 below. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

There are two BWPs configured in Cell 1, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 1. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

Table A.6.6.1.3.2-1: Supported test configurations

Configuration	Description
1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3	30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only re	equired to be tested in one of the supported test configurations.

Table A.6.6.1.3.2-2: General test parameters for SA intra-frequency event triggered reporting with per-UE gaps for PCell in FR1

Parameter	Unit	Test	Value	Comment
		configur		
		ation		
Active cell		1, 2, 3	Cell 1	
Neighbour cell		1, 2, 3	Cell 2	Cell to be identified.
RF Channel Number		1, 2, 3	1: Cell 1 and Cell 2	
Measurement gap type		1, 2, 3	Per-UE gaps	
Measurement gap repitition	ms	1, 2, 3	40	
periodicity				
Measurement gap length	ms	1, 2, 3	6	
Measurement gap offset	ms	1, 2, 3	39	
SSB configuration		1	SSB.1 FR1	
		2	SSB.1 FR1	
		3	SSB.2 FR1	
SMTC configuration		1	SMTC.2	
		2	SMTC.1	
		3	SMTC.1	
CSI-RS parameters		1	CSI-RS.1.2 FDD	
		2	CSI-RS.1.2 TDD	
		3	CSI-RS.2.2 TDD	

A3-Offset	dB	1, 2, 3	-4.5	
CP length		1, 2, 3	Normal	
Hysteresis	dB	1, 2, 3	0	
Time To Trigger	S	1, 2, 3	0	
Filter coefficient		1, 2, 3	0	L3 filtering is not used
DRX	ms	1, 2, 3		OFF
Time offset between PCell		1, 2, 3	3 μs	Synchronous EN-DC
and PSCell				
Time offset between serving		1	3 ms	Asynchronous cells.
and neighbour cells				The timing of Cell 3 is 3ms later
				than the timing of Cell 2.
		2	3 μs	Synchronous cells
		3	3 μs	Synchronous cells
T1	S	1, 2, 3	5	
T2	S	1, 2, 3	5	

Table A.6.6.1.3.2-3: NR Cell specific test parameters for SA intra-frequency event triggered reporting with per-UE gaps for PCell in FR1

Parameter	Unit	Test	Ce	ell 1	Cell 2		
		configuration	T1	T2	T1	T2	
TDD configuration		1	1T	V/A	TN	N/A	
		2	TDDC	onf.1.1	TDDConf.1.1		
		3	TDDC	onf.2.1	TDDC	onf.2.1	
PDSCH RMC		1	SR.1.	1 FDD	N	/A	
configuration		2	SR.1.	1 TDD	1		
		3	SR.2.	1 TDD			
RMSI CORESET		1		1 FDD	CR.1.	1 FDD	
RMC		2	CR.1.	1 TDD	CR.1.	1 TDD	
configuration		3	CR.2.	1 TDD	CR.2.	1 TDD	
Dedicated		1	CCR.1	.1 FDD	CCR.1	.1 FDD	
CORESET RMC		2	CCR.1	.1 TDD	CCR.1	.1 TDD	
configuration		3		2.1 TDD		.1 TDD	
OCNG Patterns		1, 2, 3		P.1	1	P.1	
TRS configuration		1		.1 FDD		/A	
		2	TRS.1	.1 TDD	N/A		
		3	TRS.1	.2 TDD	N/A		
IInitial BWP		1, 2, 3	DLBV	VP.0.1	DLBWP.0.1		
configuration				VP.0.1	ULBV	VP.0.1	
Active DL BWP		1, 2, 3	DLBV	VP.1.2	DLBV	VP.1.1	
configuration							
Active UL BWP		1, 2, 3	ULBV	VP.1.1	ULBV	VP.1.1	
configuration				. = 0			
RLM-RS	ID (0.00	1, 2, 3	CS	I-RS		SB	
$N_{oc}$ Note 2	dBm/SCS	1			-98		
		2			-98		
		3			-95		
$N_{oc}$ Note 2	dBm/15 kHz	1			-98		
		2					
^ /	4D	3	4	1.40	landianita e	1.40	
$\hat{E}_{s}/I_{ot}$	dB	2	<del>4</del>	-1.46	-Infinity	-1.46	
		3	-				
A /27	dB	1	4	4	-Infinity	4	
$\hat{E}_s/N_{oc}$	uБ	2		7	-11111111ty	-	
		3					
		J 3	l				

SS-RSRP Note 3	dBm/SCS kHz	1	-94	-94	-Infinity	-94
		2	-94	-94	-Infinity	-94
		3	-91	-91	-Infinity	-91
lo	dBm/9.36 MHz	1	-64.60	-62.25	64.60	-62.25
	dBm/9.36 MHz	2	-64.60	-62.25	64.60	-62.25
	dBm/38.16 MHz	3	-58.50	-56.16	58.50	-56.16
Propagation		1, 2, 3	AWGN			
Condition						

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

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

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

### A.6.6.1.3.3 Test Requirements

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 800 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.6.6.1.4 SA event triggered reporting tests with per-UE gaps under DRX

#### A.6.6.1.4.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clause 9.2.6.2 and 9.2.6.3.

#### A.6.6.1.4.2 Test parameters

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for PCell are given in Table A.6.6.1.4.2-1, A.6.6.1.4.2-2 and A.6.6.1.4.2-3 below. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

There are two BWPs configured in Cell 1, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 1. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

Table A.6.6.1.4.2-1: Supported test configurations

Configuration Description						
1		15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode				
2		15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode				
3		30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode				
Note:	Note: The UE is only required to be tested in one of the supported test configurations.					

Table A.6.6.1.4.2-2: General test parameters for SA intra-frequency event triggered reporting with per-UE gaps for PCell in FR1 with DRX

Parameter	Unit	Test configur	Va	lue	Comment
		ation	Test 1	Test 2	
Active cell		1, 2, 3	Cell 1		
Neighbour cell		1, 2, 3	Cell 2		Cell to be identified.
RF Channel Number		1, 2, 3	1: Cell 1 and	Cell 2	
Measurement gap type		1, 2, 3	Per-UE gaps		
Measurement gap repitition periodicity	ms	1, 2, 3	40		
Measurement gap length	ms	1, 2, 3	6		
Measurement gap offset	ms	1, 2, 3	39		
SSB configuration		1	SSB.1 FR1		
		2	SSB.1 FR1		
		3	SSB.2 FR1		
SMTC configuration		1	SMTC.2		
		2	SMTC.1		
		3	SMTC.1		
CSI-RS parameters		1	CSI-RS.1.2 F		
		2	CSI-RS.1.2 T	DD	
		3	CSI-RS.2.2 T	DD	
A3-Offset	dB	1, 2, 3	-4.5		
CP length		1, 2, 3	Normal		
Hysteresis	dB	1, 2, 3	0		
Time To Trigger	S	1, 2, 3	0		
Filter coefficient		1, 2, 3	0		L3 filtering is not used
DRX		1, 2, 3	DRX.1	DRX.2	
Time offset between PCell and PSCell		1, 2, 3	3 μs		Synchronous EN-DC
Time offset between serving and neighbour cells		1	3 ms		Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
		2	3 μs		Synchronous cells
		3	3 μs		Synchronous cells
T1	S	1, 2, 3	5		
T2	S	1, 2, 3	5	10	

Table A.6.6.1.4.2-3: NR Cell specific test parameters for SA intra-frequency event triggered reporting with per-UE gaps for PCell in FR1 with DRX

Parameter	Unit	Test	Cell 1				II 2
		configuration	T1	T2	T1	T2	
TDD configuration		1	TN/A		TN/A TN/A		
		2	TDDConf.1.1 TDDConf.2.1		TDDConf.1.1		
		3			TDDConf.2.1		
PDSCH RMC		1	SR.1.1 FDD		N/A		
configuration		2	SR.1.	1 TDD			

		3	SR.2.	1 TDD	DD		
RMSI CORESET		1	CR.1.	1 FDD	CR.1.	1 FDD	
RMC		2	CR.1.	1 TDD	CR.1.	1 TDD	
configuration		3	CR.2.	1 TDD	CR.2.	1 TDD	
Dedicated		1	CCR.1	.1 FDD	CCR.1	.1 FDD	
CORESET RMC		2	CCR.1	.1 TDD	CCR.1.1 TDD		
configuration		3	CCR.2	.1 TDD	CCR.2	.1 TDD	
OCNG Patterns		1, 2, 3		P.1		P.1	
TRS configuration		1		.1 FDD	N/		
		2		.1 TDD	N/		
		3	TRS.1	.2 TDD	N/	/A	
Ilnitial BWP		1, 2, 3	DLBV	/P.0.1	DLBW	/P.0.1	
configuration				/P.0.1	ULBW		
Active DL BWP		1, 2, 3	DLBV	DLBWP.1.2		/P.1.1	
configuration							
Active UL BWP		1, 2, 3	ULBV	ULBWP.1.1		ULBWP.1.1	
configuration		4.0.0	001.00		0.0	000	
RLM-RS	dBm/SCS	1, 2, 3	CSI-RS SSB			<u> В</u>	
$N_{ac}$ Note 2	abm/scs				.98		
		2 3			.98		
	dBm/15 kHz	1			95		
$N_{oc}$ Note 2	abm/15 kHZ	2		-	.98		
		3					
<u> </u>	dB	1	4	-1.46	-Infinity	-1.46	
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	uБ	2	4	-1.40	-iiiiiiiity	-1.40	
		3					
$\hat{\mathbf{r}}$ / $\mathbf{x}$	dB	1	4	4	-Infinity	4	
$\hat{E}_s/N_{oc}$	42	2				·	
		3					
SS-RSRP Note 3	dBm/SCS kHz	1	-94	-94	-Infinity	-94	
		2	-94	-94	-Infinity	-94	
		3	-91	-91	-Infinity	-91	
lo	dBm/9.36 MHz	1	-64.60	-62.25	64.60	-62.25	
	dBm/9.36 MHz	2	-64.60	-62.25	-64.60	-62.25	
	dBm/38.16 MHz	3	-58.50	-56.16	58.50	-56.16	
Propagation Condition		1, 2, 3	AWGN				

Note 1: Table A.6.6.1.4.2-1The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

Note 2: Table A.6.6.1.4.2-1 Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 3: Table A.6.6.1.4.2-1SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table A.6.6.1.4.2-4: Void

Table A.6.6.1.4.2-5: Void

### A.6.6.1.4.3 Test Requirements

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 6400 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.6.6.1.5 SA event triggered reporting tests without gap under non-DRX with SSB index reading

#### A.6.6.1.5.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the FDD intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2.

#### A.6.6.1.5.2 Test parameters

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for FDD PCell and neighbour cell are given in Table A.6.6.1.5.2-1 and A.6.6.1.5.2-2 below. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

Table A.6.6.1.5.2-1: Supported test configurations

Configuration	Description				
1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode				

Table A.6.6.1.5.2-2: General test parameters for SA intra-frequency event triggered reporting without gap for FDD PCell in FR1 with SSB index reading

Parameter	Unit	Test configur ation	Value	Comment
Active cell		1	Cell 1	
Neighbour cell		1	Cell 2	Cell to be identified.
RF Channel Number		1	1: Cell 1 and Cell 2	
SSB configuration		1	SSB.1 FR1	
SMTC configuration		1	SMTC.2	
A3-Offset	dB	1	-4.5	
CP length		1	Normal	
Hysteresis	dB	1	0	
Time To Trigger	S	1	0	
Filter coefficient		1	0	L3 filtering is not used
DRX	ms	1		OFF
Time offset between PCell and PSCell		1	3 μs	Synchronous EN-DC
Time offset between serving and neighbour cells		1	3 ms	Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
T1	S	1	5	
T2	S	1	5	

Table A.6.6.1.5.2-3: NR Cell specific test parameters for SA intra-frequency event triggered reporting without gap for FDD PCell in FR1 with SSB index reading

Parameter	Unit	Test	Cell 1		Cell 2		
		configuration	T1	T2	T1	T2	
TDD configuration		1	N	N/A		N/A	
PDSCH RMC		1	SR.1.	SR.1.1 FDD		N/A	
configuration							
RMSI CORESET		1	CR.1.	1 FDD	CR.1.	1 FDD	
RMC							
configuration							
Dedicated		1	CCR.1	.1 FDD	CCR.1	.1 FDD	
CORESET RMC							
configuration							
OCNG Patterns		1		P.1	OF		
TRS configuration		1		.1 FDD	N/A		
IInitial BWP		1		DLBWP.0,1		DLBWP.0.1	
configuration				VP.0.1	ULBWP.0.1		
Active DL BWP		1	DLBV	VP.1.1	DLBWP.1.1		
configuration							
Active UL BWP		1	ULBV	VP.1.1	ULBW	JLBWP.1.1	
configuration							
RLM-RS		1	SS	SB	SS	<u>SB</u>	
$N_{oc}^{}$ Note 2	dBm/SCS	1		-	.98		
$N_{oc}^{}$ Note 2	dBm/15 kHz	1		-98			
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	1	4	4 -1.46		-1.46	
$\hat{E}_s/N_{oc}$	dB	1	4	4	-Infinity	4	
SS-RSRP Note 3	dBm/SCS kHz	1	-94	-94	-Infinity	-94	
lo	dBm/9.36 MHz	1	-64.60	-62.25	64.60	-62.25	
Propagation		1	AWGN				
Condition							

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

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

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

### A.6.6.1.5.3 Test Requirements

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE is required to read the neighbour cell SSB index and report the acquired SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.6.6.1.6 SA event triggered reporting tests with per-UE gaps under non-DRX with SSB index reading

#### A.6.6.1.6.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the FDD intra-frequency cell search requirements in clause 9.2.6.2 and 9.2.6.3.

#### A.6.6.1.6.2 Test parameters

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for FDD PCell and neighbour cell are given in Table A.6.6.1.6.2-1 and A.6.6.1.6.2-2 below. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

There are two BWPs configured in Cell 1, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 1. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

Table A.6.6.1.6.2-1: Supported test configurations

Configuration	Description
1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode

Table A.6.6.1.6.2-2: General test parameters for SA intra-frequency event triggered reporting with gap for FDD PCell in FR1 with SSB index reading

Parameter	Unit	Test configur ation	Value	Comment
Active cell		1	Cell 1	
Neighbour cell		1	Cell 2	Cell to be identified.
RF Channel Number		1	1: Cell 1 and Cell 2	
Measurement gap type		1	Per-UE gaps	
Measurement gap repitition periodicity	ms	1	40	
Measurement gap length	ms	1	6	
Measurement gap offset	ms	1	39	
SSB configuration		1	SSB.1 FR1	
SMTC configuration		1	SMTC.2	
CSI-RS parameters		1	CSI-RS.1.2 FDD	
A3-Offset	dB	1	-4.5	
CP length		1	Normal	
Hysteresis	dB	1	0	
Time To Trigger	S	1	0	
Filter coefficient		1	0	L3 filtering is not used
DRX	ms	1		OFF
Time offset between PCell and PSCell		1	3 μs	Synchronous EN-DC
Time offset between serving and neighbour cells		1	3 ms	Asynchronous cells. The timing of Cell 3 is 3ms later than the timing of Cell 2.
T1	S	1	5	
T2	S	1	5	

Table A.6.6.1.6.2-3: NR Cell specific test parameters for SA intra-frequency event triggered reporting with gap for FDD PCell in FR1 with SSB index reading

Parameter	Unit	Test	Ce	Cell 1 C		Cell 2	
		configuration	T1	T2	T1	T2	
TDD configuration		1	N	N/A		N/A	
PDSCH RMC		1	SR.1.	SR.1.1 FDD		N/A	
configuration							
RMSI CORESET		1	CR.1.	1 FDD	CR.1.	1 FDD	
RMC							
configuration							
Dedicated		1	CCR.1	.1 FDD	CCR.1	.1 FDD	
CORESET RMC							
configuration							
OCNG Patterns		1		P.1	OF		
TRS configuration		1		TRS.1.1 FDD		/A	
IInitial BWP		1		√P.0.1	DLBWP.0.1		
configuration			ULBV	√P.0.1	ULBWP.0.1		
Active DL BWP		1	DLBV	DLBWP.1.2		DLBWP.1.1	
configuration							
Active UL BWP		1	ULBV	VP.1.1	ULBV	/P.1.1	
configuration							
RLM-RS		1	CSI	-RS	SS	SB	
$N_{oc}^{}$ Note 2	dBm/SCS	1		-	.98		
$N_{oc}$ Note 2	dBm/15 kHz	1		-	-98		
$\hat{E}_{s}/I_{ot}$	dB	1	4	-1.46	-Infinity	-1.46	
$\hat{E}_s/N_{oc}$	dB	1	4	4	-Infinity	4	
SS-RSRP Note 3	dBm/SCS kHz	1	-94	-94 -94		-94	
lo	dBm/9.36 MHz	1	-64.60	-94 -94 -Infinity -94 -64.60 -62.2564.60 -62.25		-62.25	
Propagation		1	AWGN				
Condition				,			

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

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

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

### A.6.6.1.6.3 Test Requirements

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE is required to read the neighbour cell SSB index and report the acquired SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.6.6.2 Inter-frequency Measurements

## A.6.6.2.1 SA event triggered reporting tests for FR1 without SSB time index detection when DRX is not used

#### A.6.6.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 2. The test parameters are given in Tables A.6.6.2.1.1-1, A.6.6.2.1.1-2 and A.6.6.2.1.1-3.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.6.6.2.1.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table A.6.6.2.1.1-2 is provided for UE that supports per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 2. Otherwise it is only required to pass test 1.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

Table A.6.6.2.1.1-1: SA event triggered reporting tests without SSB index reading for FR1-FR1

	Config	Description			
1		NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode			
2		NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode			
3		NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode			
Note 1:	The UE is only re	equired to be tested in one of the supported test configurations			
Note 2:	target NR cell has the same SCS, BW and duplex mode as NR serving cell				

Table A.6.6.2.1.1-2: General test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection

Parameter	Unit	Test	Va	lue	Comment
		configurati on	Test 1	Test 2	
NR RF Channel Number		Config 1,2,3	1, 2		Two FR1 NR carrier frequencies is used.
Active cell		Config 1,2,3	NR cell 1 (Pce	ell)	NR Cell 1 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3	NR cell2		NR cell 2 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3	0	4	As specified in clause 9.1.2-1.
Measurement gap offset		Config 1,2,3	39	9	
SMTC-SSB parameters		Config 1	SSB.1 FR1		As specified in clause A.3.10.1
		Config 2	SSB.1 FR1		As specified in clause A.3.10.1
		Config 3	SSB.2 FR1		As specified in clause A.3.10.1
A3-Offset	dB	Config 1,2,3	-6		
Hysteresis	dB	Config 1,2,3	0		
CP length		Config 1,2,3	Normal		
TimeToTrigger	S	Config 1,2,3	0		
Filter coefficient		Config 1,2,3	0		L3 filtering is not used
DRX		Config 1,2,3	OFF		DRX is not used
Time offset between		Config 1	3ms		Asynchronous cells.
serving and neighbour					The timing of Cell 2 is 3ms later
cells		0 5 0 6	_		than the timing of Cell 1.
		Config 2,3	3μs		Synchronous cells.
T1	s	Config 1,2,3	5		
T2	S	Config 1,2,3	1	1	

Table A.6.6.2.1.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection

Parameter	Unit	Test	Cell 1		Cell 2			
		configuratio	T1	T2	T1	T2		
		n						
NR RF Channel Number		Config 1,2,3	1		2			
Duplex mode		Config 1		FDD				
		Config 2,3		-	TDD			
TDD configuration		Config 1	Not Applicable					
		Config 2		TDDConf.1.1				
		Config 3		TDD	Conf.2.1			
BWchannel	MHz	Config 1,2		10: N	$I_{RB,c} = 52$			
		Config 3	40: N <sub>RB,c</sub> = 106					
BWP BW	MHz	Config 1,2		10: N <sub>RB,c</sub> = 52				
		Config 3	40: N <sub>RB,c</sub> = 106		<sub>RB,c</sub> = 106			
Initial DL BWP		Config 1, 2,	DLBW	DLBWP.0.1		NA		
Initial UL BWP		3	ULBWP.0.1			NA		

BWP	Dedicated DL			DLBV	VP.1.1		NA	
configurati on	BWP Dedicated UL BWP			ULBV	VP.1.1		NA	
TRS configuration			Config 1	TRS.1	.1 FDD	NA		
			Config 2	TRS.1	.1 TDD	NA		
			Config 3	TRS.1.2 TDD		NA		
OCNG Patte A.3.2.1.1 (O	rns defined in		Config 1,2,3	OF	D 1	OP.1		
PDSCH Refe			Carefier 1				-	
measuremer			Config 1		1 FDD		_	
measuremen	it orialinoi		Config 2		SR.1.1 TDD			
			Config 3		1 TDD			
CORESET F	Reference		Config 1		1 FDD		-	
Channel			Config 2		1 TDD			
01470 6			Config 3	CR2.7	1 TDD			
in A.3.11	guration defined		Config 1	SM	ΓC.2	SM	ITC.5	
			Config 2, 3	SM	ΓC.1	SM	ITC.4	
PDSCH/PDC	CCH subcarrier	kHz	Config 1,2			15		
spacing	spacing		Config 3			30		
EPRE ratio of	of PSS to SSS							
EPRE ratio o	of PBCH DMRS							
	EPRE ratio of PBCH to PBCH							
	of PDCCH DMRS							
EPRE ratio o	of PDCCH to							
PDCCH DMI			Config 1,2,3	(	0		0	
	of PDSCH DMRS							
EPRE ratio o	of PDSCH to							
	of OCNG DMRS							
EPRE ratio of OCNG DMR	of OCNG to							
$N_{oc}$ Note2	O (NOIC 1)	dBm/15 kHz		-6	98	-98		
$N_{oc}^{ m Note2}$		dBm/S	Config 1,2 -98		98		-98	
IV <sub>oc</sub>	N <sub>oc</sub>		Config 1,2	-96 -95			-96 -95	
SS-RSRP No	SS-RSRP Note 3		Config 1,2	-94	-94	-Infinity	-91	
20		dBm/S CS	Config 3	-91	-91	-Infinity	-88	
$\hat{E}_{s}/I_{ot}$		dB	Config 1,2,3,4,5,6	4	4	-Infinity	7	
$\hat{E}_s/N_{oc}$		dB	Config 1,2,3	4	4	-Infinity	7	
Io <sup>Note3</sup>		dBm/9. 36MHz	Config 1,2	-64.59	-64.59	-70.05	-62.26	
		dBm/38 .16MHz	Config 3	-58.49	-58.49	-63.94	-56.15	
Propagation Condition			Config 1,2,3	2,3 AWGN		AWGN		

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

#### A.6.6.2.1.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 760 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.6.6.2.2 SA event triggered reporting tests for FR1 without SSB time index detection when DRX is used

#### A.6.6.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 2. The test parameters are given in Tables A.6.6.2.2.1-1, A.6.6.2.2.1-2 and A.6.6.2.2.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.6.6.2.2.1-2 is provided for UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #4 as defined in Table A.6.6.2.2.1-2 is provided for UE that supports per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

Table A.6.6.2.2.1-1: SA event triggered reporting tests without SSB index reading for FR1-FR1

	Config	Description				
1		NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode				
2		NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode				
3		NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode				
Note 1:	ote 1: The UE is only required to be tested in one of the supported test configurations					
Note 2:	target NR cell ha	as the same SCS, BW and duplex mode as NR serving cell				

Table A.6.6.2.2.1-2: General test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection

Parameter	Unit	Test	Value			Comment			
		configurati	Test	Test					
		on	1	2	3	4			
NR RF Channel Number		Config 1,2,3	1, 2			Two FR1 NR carrier frequencies is used.			
Active cell		Config 1,2,3	NR cell 1 (Pcell)			NR Cell 1 is on NR RF channel number 1.			
Neighbour cell		Config 1,2,3	NR ce	II2			NR cell 2 is on NR RF channel number 2.		
Gap Pattern Id		Config 1,2,3	0		4		As specified in clause 9.1.2-1.		
Measurement gap offset		Config 1,2,3	39		9				
SMTC-SSB parameters		Config 1	SSB.1	FR1			As specified in clause A.3.10.1		
		Config 2	SSB.1 FR1			As specified in clause A.3.10.1			
		Config 3	SSB.2	FR1			As specified in clause A.3.10.1		
A3-Offset	dB	Config 1,2,3	-6						
Hysteresis	dB	Config 1,2,3	0						
CP length		Config 1,2,3	Norma	ıl					
TimeToTrigger	S	Config 1,2,3	0						
Filter coefficient		Config 1,2,3	0				L3 filtering is not used		
DRX		Config 1,2,3	DRX .1	DRX .2	DRX .1	DRX .2	As specified in clause A.3.3		
Time offset between serving and neighbour cells		Config 1	3ms		3ms				Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		Config 2,3	3μs			Synchronous cells.			
T1	S	Config 1,2,3	5						
T2	S	Config 1,2,3	1.1	11	1.1	11			

Table A.6.6.2.2.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection

Parameter	Unit	Test	Cell 1		Cell 2	
		configuratio	T1 T2		T1	T2
		n				
NR RF Channel Number		Config 1,2,3	1		2	
Duplex mode		Config 1	FDD			

			Config 2,3			TDD		
TDD configuration			Config 1				pplicable	
ŭ			Config 2		TDD			
			Config 3			Conf.2.1		
BW <sub>channel</sub>		MHz	Config 1,2		10: N <sub>RB,c</sub> = 52			
			Config 3	40: N <sub>RB,c</sub> = 106				
BWP BW		MHz	Config 1,2		10: N	<sub>RB,c</sub> = 52		
			Config 3		40: N	<sub>RB,c</sub> = 106		
BWP	Initial DL BWP		Config 1, 2,	DLBV				
configuratio			3					
n	Initial UL BWP		Config 1, 2, 3	ULBW	/P.0.1		NA	
	Dedicated DL BWP			DLBW	/P.1.1		NA	
	Dedicated UL BWP			ULBW	/P.1.1		NA	
TRS configura			Config 1	TRS.1	1 FDD		NA	
			Config 2	TRS.1	1 TDD		NA	
			Config 3	TRS.1	2 TDD		NA	
OCNG Patter	ns defined in		Config 1,2,3					
A.3.2.1.1 (OF			351g 1,2,5	OF	P.1	C	)P.1	
PDSCH Refe	rence		Config 1	SR.1.1 FDD			-	
measurement channel			Config 2	SR 1	1 TDD			
			Config 3	SR2.1				
CORESET Reference			Config 1		CR.1.1 FDD		_	
Channel			Config 2		1 TDD	_		
			Config 3		I TDD			
SMTC configurence in A.3.11	uration defined		Config 1		ΓC.2	SMTC.5		
			Config 2, 3	SM	ΓC.1	SMTC.4		
PDSCH/PDC	CH subcarrier	kHz	Config 1,2			15		
spacing	011 0412 0411101		Config 3			30		
EPRE ratio of	f PSS to SSS		g s g s					
	F PBCH DMRS							
	f PBCH to PBCH							
	FPDCCH DMRS							
EPRE ratio of			Config 1,2,3	(	0		0	
	F PDSCH DMRS							
EPRE ratio of PDSCH to PDSCH								
EPRE ratio of OCNG DMRS to SSS(Note 1)								
OCNG DMRS	PRE ratio of OCNG to							
$N_{oc}^{ m Note2}$		dBm/15 kHz	Config 1,2,3	-98		-98		
$N_{oc}^{ m Note2}$		dBm/S	Config 1,2	-9		-98		
		CS	Config 3	-9			-95	
SS-RSRP Note	3		Config 1,2	-94	-94	-Infinity	-91	

	dBm/S CS	Config 3	-91	-91	-Infinity	-88
$\hat{E}_{s}/I_{ot}$	dB	Config 1,2,3,4,5,6	4	4	-Infinity	7
$\hat{E}_s/N_{oc}$	dB	Config 1,2,3	4	4	-Infinity	7
Io <sup>Note3</sup>	dBm/9. 36MHz	Config 1,2	-64.59	-64.59	-70.05	-62.2
	dBm/38 .16MHz	Config 3	-58.49	-58.49	-63.94	-56.15
Propagation Condition		Config 1,2,3	AWGN AWG		VGN	

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

Table A.6.6.2.2.1-4: DRX-Configuration for SA inter-frequency event triggered reporting without SSB time index detection

Field	Test1&3	Test2&4	Comment
1 1010	Value	Value	
drx-onDurationTimer	ms1	ms1	As specified in clause 6.3.2 in TS
drx-InactivityTimer	ms1	ms1	38.331 [2]
drx-RetransmissionTimerDL	sl1	sl1	
drx-RetransmissionTimerUL	sl1	sl1	
drx-LongCycleStartOffset	ms40	Ms640	
shortDRX	disable	disable	

Table A.6.6.2.2.1-5: *TimeAlignmentTimer* -Configuration SA inter-frequency event triggered reporting without SSB time index detection

Field	Value	Comment
TimeAlignmentTimer	ms500	As specified in clause 6.3.2 in TS 38.331 [2]

# A.6.6.2.2.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1080 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 10240 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1080 ms from the beginning of time period T2. The UE shall not send event triggered

measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 10240 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1, 2, 3 and 4 UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

A.6.6.2.3 Void

A.6.6.2.4 Void

A.6.6.2.5 SA event triggered reporting tests for FR1 with SSB time index detection when DRX is not used

#### A.6.6.2.5.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 2. The test parameters are given in Tables A.6.6.2.5.1-1, A.6.6.2.5.1-2 and A.6.6.2.5.1-3.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.6.6.2.5.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table A.6.6.2.5.1-2 is provided for UE that supports per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 2. Otherwise it is only required to pass test 1.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

Table A.6.6.2.5.1-1: SA event triggered reporting tests with SSB index reading for FR1-FR1

	Config	Description				
1		NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode				
2		NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode				
3		NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode				
Note 1:	The UE is only required to be tested in one of the supported test configurations					
Note 2:	target NR cell has the same SCS, BW and duplex mode as NR serving cell					

Table A.6.6.2.5.1-2: General test parameters for SA inter-frequency event triggered reporting for FR1 with SSB time index detection

Parameter	Unit	Test	Value		Comment
		configurati on	Test 1	Test 2	
NR RF Channel Number		Config 1,2,3	1, 2		Two FR1 NR carrier frequencies is used.
Active cell		Config 1,2,3	NR cell 1 (Pce	ell)	NR Cell 1 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3	NR cell2		NR cell 2 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3	0	4	As specified in clause 9.1.2-1.
Measurement gap offset		Config 1,2,3	39	9	
SMTC-SSB parameters		Config 1	SSB.1 FR1		As specified in clause A.3.10.1
		Config 2	SSB.1 FR1		As specified in clause A.3.10.1
		Config 3	SSB.2 FR1		As specified in clause A.3.10.1
A3-Offset	dB	Config 1,2,3	-6		
Hysteresis	dB	Config 1,2,3	0		
CP length		Config 1,2,3	Normal		
TimeToTrigger	S	Config 1,2,3	0		
Filter coefficient		Config 1,2,3	0		L3 filtering is not used
DRX		Config 1,2,3	OFF		DRX is not used
Time offset between serving and neighbour cells		Config 1	3ms		Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		Config 2,3	3μs		Synchronous cells.
T1	s	Config 1,2,3	5		
T2	s	Config 1,2,3	1.1	1	

Table A.6.6.2.5.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 with SSB time index detection

Par	Parameter		Test	Ce	ell 1	Cell 2	
			configuratio n	T1	T1 T2		T2
NR RF Chan	nel Number		Config 1,2,3		1		2
Duplex mode	<b>!</b>		Config 1		F	DD	
			Config 2,3		T	DD	
TDD configur	ation		Config 1		Not Ap	plicable	
			Config 2		TDDC	onf.1.1	
			Config 3		TDDC	onf.2.1	
BW <sub>channel</sub>		MHz	Config 1,2		10: N <sub>RB,c</sub> = 52		
			Config 3		40: N <sub>RB,c</sub> = 106		
BWP BW		MHz	Config 1,2		10: N <sub>RB,c</sub> = 52		
			Config 3		40: N <sub>RB,c</sub> = 106		
BWP	Initial DL BWP			DLB\	DLBWP.0.1		NA
configuratio	Initial UL BWP			ULB\	ULBWP.0.1		NA
n	Dedicated DL		Config 1, 2,	DLB\	WP.1.1		NA
	BWP		3				
	Dedicated UL BWP			ULBWP.1.1 NA			NA
TRS configur	ation		Config 1	TRS.1	I.1 FDD	NA	
			Config 2	TRS.1	I.1 TDD	NA	

		Config 3	TRS.1	I.2 TDD		NA
OCNG Patterns defined in		Config 1,2,3		P.1	(	OP.1
A.3.2.1.1 (OP.1)		<b>3</b>				
PDSCH Reference		Config 1	SR.1	SR.1.1 FDD -		
measurement channel		Config 2	SR.1	.1 TDD		
		Config 3	SR2.	1 TDD		
CORESET Reference		Config 1		.1 FDD		-
Channel		Config 2		.1 TDD		
		Config 3	CR2.	1 TDD	1	
SMTC configuration defined in A.3.11		Config 1	SM	TC.2	SI	MTC.5
		Config 2, 3	SM	TC.1	SI	MTC.4
PDSCH/PDCCH subcarrier	kHz	Config 1,2		1	15	
spacing		Config 3		3	30	
EPRE ratio of PSS to SSS						
EPRE ratio of PBCH DMRS						
to SSS						
EPRE ratio of PBCH to PBCH						
DMRS						
EPRE ratio of PDCCH DMRS					0	
to SSS						
EPRE ratio of PDCCH to		Config 1 2 2		0		
PDCCH DMRS		Config 1,2,3		0		
EPRE ratio of PDSCH DMRS						
to SSS EPRE ratio of PDSCH to						
PDSCH						
EPRE ratio of OCNG DMRS						
to SSS(Note 1)						
EPRE ratio of OCNG to						
OCNG DMRS (Note 1)						
$N_{oc}^{ m Note2}$	dBm/15		-	98		-98
	kHz					
$N_{oc}^{ m Note2}$	dBm/S	Config 1,2		98		-98
	CS	Config 3	ı	95		-95
SS-RSRP Note 3	dBm/S	Config 1,2	-94	-94	-Infinity	-91
	CS	Config 3	-91	-91	-Infinity	-88
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	Config 1,2,3	4	4	-Infinity	7
$\hat{E}_s/N_{oc}$	dB	Config 1,2,3	4	4	-Infinity	7
Io <sup>Note3</sup>	dBm/9. 36MHz	Config 1,2	-64.59	-64.59	-70.05	-62.2
	dBm/38 .16MHz	Config 3	-58.4	-58.49	-63.94	-56.15
Propagation Condition		Config 1,2,3	AV	VGN	AWGN	

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

Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

# A.6.6.2.5.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1040 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 880 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.6.6.2.6 SA event triggered reporting tests for FR1 with SSB time index detection when DRX is used

#### A.6.6.2.6.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 2. The test parameters are given in Tables A.6.6.2.6.1-1, A.6.6.2.6.1-2 and A.6.6.2.6.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.6.6.2.6.1-2 is provided for UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #4 as defined in Table A.6.6.2.6.1-2 is provided for UE that supports per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

UE needs to be provided at least once every 500 ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

Table A.6.6.2.6.1-1: SA event triggered reporting tests with SSB index reading for FR1-FR1

	Config Description					
1		NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode				
2		NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode				
3		NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode				
Note 1:	The UE is only required to be tested in one of the supported test configurations					
Note 2:	target NR cell has the same SCS, BW and duplex mode as NR serving cell					

Table A.6.6.2.6.1-2: General test parameters for SA inter-frequency event triggered reporting for FR1 with SSB time index detection

Parameter	Unit	Test		Va	lue		Comment
		configurati	Test	Test	Test	Test	
		on	1	2	3	4	
NR RF Channel Number		Config 1,2,3	1, 2				Two FR1 NR carrier frequencies is used.
Active cell		Config 1,2,3	NR ce	II 1 (Pce	ell)		NR Cell 1 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3	NR ce	II2			NR cell 2 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3	0		4		As specified in clause 9.1.2-1.
Measurement gap offset		Config 1,2,3	39		9		
SMTC-SSB parameters		Config 1	SSB.1	FR1			As specified in clause A.3.10.1
		Config 2	SSB.1	FR1			As specified in clause A.3.10.1
		Config 3	SSB.2	FR1			As specified in clause A.3.10.1
A3-Offset	dB	Config 1,2,3	-6				
Hysteresis	dB	Config 1,2,3	0				
CP length		Config 1,2,3	Norma	al			
TimeToTrigger	S	Config 1,2,3	0				
Filter coefficient		Config 1,2,3	0				L3 filtering is not used
DRX		Config 1,2,3	DRX .1	DRX .2	DRX .1	DRX .2	As specified in clause A.3.3
Time offset between serving and neighbour cells		Config 1	3 ms				Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		Config 2,3	3 μs				Synchronous cells.
T1	S	Config 1,2,3	5				
T2	s	Config 1,2,3	1.3	13.5	1.3	13.5	

Table A.6.6.2.6.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 with SSB time index detection

Parameter		Unit	Test	Ce	II 1	Cell 2		
			configuratio	T1	T1 T2		T2	
			n					
NR RF Char	nel Number		Config 1,2,3	1			2	
Duplex mode	Э		Config 1		F	DD		
			Config 2,3			ΓDD		
TDD configu	ration		Config 1		Not A	pplicable		
			Config 2		TDDConf.1.1			
			Config 3		TDD	Conf.2.1	onf.2.1	
BW <sub>channel</sub>		MHz	Config 1,2		10: $N_{RB,c} = 52$			
			Config 3		40: N <sub>RB,c</sub> = 106			
BWP BW		MHz	Config 1,2		10: N <sub>RB,c</sub> = 52			
			Config 3		40: N <sub>RB,c</sub> = 106			
BWP	Initial DL BWP			DLBW	/P.0.1	NA		
configurati	Initial UL BWP			ULBW	ULBWP.0.1 NA			
on	Dedicated DL		Config 1, 2,	DLBWP.1.1 NA			NA	
	BWP		3	ULBWP.1.1 NA				
	Dedicated UL BWP					NA		

TRS configuration		Config 1	TRS 1	1 FDD		NA
The configuration		Config 2		1 TDD		NA
		Config 3		2 TDD		NA
OCNG Patterns defined in		Config 1,2,3	11(0.1)	2 100		147 (
A.3.2.1.1 (OP.1)		001111g 1,2,0	OF	<b>9</b> 1	ے ا	)P.1
PDSCH Reference		Config 1				-
measurement channel					-	
mododromone ondrinor		Config 2		1 TDD		
CODECET D. (		Config 3		TDD		
CORESET Reference		Config 1		1 FDD		-
Channel		Config 2		1 TDD		
0.150		Config 3	CR2.2	I TDD		
SMTC configuration defined in A.3.11		Config 1	SMT	ΓC.2	SN	MTC.5
III A.3.11		-				
		Config 2, 3	SMT	ΓC.1	SN	/ITC.4
PDSCH/PDCCH subcarrier	kHz	Config 1,2			15	
spacing		Config 3			30	
EPRE ratio of PSS to SSS		<u> </u>				
EPRE ratio of PBCH DMRS						
to SSS						
EPRE ratio of PBCH to PBCH		-				
DMRS					0	
EPRE ratio of PDCCH DMRS						
to SSS						
EPRE ratio of PDCCH to		-				
PDCCH DMRS		Config 1,2,3	(	)		
EPRE ratio of PDSCH DMRS		3 , , , ,				
to SSS						
EPRE ratio of PDSCH to						
PDSCH						
EPRE ratio of OCNG DMRS						
to SSS(Note 1)						
EPRE ratio of OCNG to						
OCNG DMRS (Note 1)						
$N_{oc}^{ m Note2}$	dBm/15		-6	)8	-98	
· oc	kHz					
$N_{oc}^{ m Note2}$	dBm/S	Config 1,2	-9	98		-98
· · oc	CS	Config 3		)5		-95
SS-RSRP Note 3	dBm/S	Config 1,2	-94	-94	-Infinity	-91
	CS	Config 3	-91	-91	-Infinity	-88
r / r	dB	Config 1,2,3	4	4	-Infinity	7
$\hat{E}_{\scriptscriptstyle s}/I_{\scriptscriptstyle ot}$					,	
$\hat{E}_s/N_{oc}$	dB	Config 1,2,3	4	4	-Infinity	7
IoNote3	dBm/9.	Config 1,2	-64.59	-64.59	-70.05	-62.26
	36MHz	Joining 1,2	01.00	01.00	. 5.55	02.20
	dBm/38	Config 3	-58.49	-58.49	-63.94	-56.15
	.16MHz	259	33.10	55.10		53.15
Propagation Condition		Config 1,2,3	AW	GN	A۱	WGN

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

#### A.6.6.2.6.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1280 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 13440 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1280 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 13440 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1, 2, 3 and 4 UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

A.6.6.2.7 Void

A.6.6.2.8 Void

# A.6.6.3 Inter-RAT Measurements

# A.6.6.3.1 SA NR - E-UTRAN event-triggered reporting in non-DRX in FR1

#### A.6.6.3.1.1 Test Purpose and Environment

The purpose of this set of tests is to verify that the UE makes correct event-triggered reporting of inter-RAT E-UTRAN measurements when operating in standalone (SA) operation with PCell in FR1. This test shall partly verify the cell search and measurement requirements in Clauses 9.4.2 and 9.4.3.

In each test there are two cells: Cell 1 and Cell 2. Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN inter-RAT neighbour cell. In the measurement control information from the PCell it is indictated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter RAT neighbour becomes better than threshold2) is to be used. Each test consists of two consecutive time periods, with durations T1 and T2, respectively. Prior to the start of time duration T1, the UE shall be fully synchronized to Cell 1. During T1, the UE shall not have any information on Cell 2.

Supported test configurations are shown in table A.6.6.3.1.1-1. General test parameters are provided in Table A.6.6.3.1.1-2 below. Test parameters for Cell 1 and Cell 2, valid for both time duration T1 and T2, are provided in Tables A.6.6.3.1.1-3 and A.6.6.3.1.1-4, respectively.

Table A.6.6.3.1.1-1: Supported test configurations in SA inter-RAT E-UTRAN event triggered reporting in non-DRX with PCell in FR1

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

Table A.6.6.3.1.1-2: General test parameters for SA inter-RAT E-UTRAN event triggered reporting in non-DRX with PCell in FR1

Parameter	Unit	Value	Comment
NR RF Channel Number		1	1 NR carrier frequency is used in the test
LTE RF Channel Number		1	1 LTE carrier frequency is used in the test
Channel Bandwidth	MHz	As specified in Tables A.6.6.3.1.1-2 and A.6.6.3.1.1-3.	
Active cell		Cell 1	Cell 1 is on RF channel number 1
Neighbour cell		Cell 2	Cell 2 is on RF channel number 2
Gap Pattern Id		0	As specified in Clause Table 9.1.2-1. Per- UE gap pattern.
NR measurement quantity		SS-RSRP	Measurement quantity for Cell 1
Inter-RAT E-UTRAN measurement quantity		RSRP	Measurement quantity for Cell 2
b2-Threshold1	dBm	Note 1	SS-RSRP threshold for SS-RSRP measurement on cell1 for event B2
b2-Threshold2EUTRA	dBm	-97	E-UTRAN RSRP threshold for SS-RSRP measurement on cell1 for event B2
Hysteresis	dB	0	
TimeToTrigger	S	0	
Filter coefficient		0	L3 filtering is not used
DRX		OFF	OFF
T1	S	5	
T2	S	5	
Note 1: Values are defined	in Table A.6	5.6.3.1.1-3	

Table A.6.6.3.1.1-3: PCell specific test parameters for SA inter-RAT E-UTRA event triggered reporting in non-DRX with PCell in FR1

Parameter		Parameter Unit		Cell 1	
				T1 T2	
RF channel number			1, 2, 3, 4, 5, 6	1	
Duplex mode			1, 2, 3	FDD	
			4, 5, 6	TDD	
TDD Configuration	SCS=15 KHz		2, 5	TDDConf.1.1	
	SCS=30 KHz		3, 6	TDDConf.1.2	
BW <sub>channel</sub>		MHz	1, 4	10: N <sub>RB,c</sub> = 52 (FDI	
			2, 5	10: N <sub>RB,c</sub> = 52 (TI	
			3, 6	40: N <sub>RB,c</sub> =	= 106 (TDD)
			1, 4	SR.1	.1 FDD

PDSCH reference n	neasurement		2, 5	SR.	1.1 TDD
channel			3, 6		2.1 TDD
CORSET reference	channel		1, 4		1.1 FDD
			2, 5		1.1 TDD
			3, 6		2.1 TDD
BWP configurations	Initial DL BWP		1, 2, 3, 4, 5, 6		BWP.0.1
Ŭ	Dedicated DL BWP		1, 2, 3, 4, 5, 6	DLE	BWP.1.1
	Initial UL BWP		1, 2, 3, 4, 5, 6		BWP.0.1
	Dedicated UL BWP		1, 2, 3, 4, 5, 6		BWP.1.1
OCNG pattern <sup>Note1</sup>	_		1, 2, 3, 4, 5, 6		DP.1
SMTC configuration	1		1, 2, 3, 4, 5, 6		ИТС.1
SSB configuration	•		1, 2, 4, 5		3.1 FR1
oob oomigaration			3, 6		3.2 FR1
b2-Threshold1			1, 2, 4, 5		-98
D2 111100110101		dBm	3, 6		-95
EPRE ratio of PSS	to SSS		1, 2, 3, 4, 5, 6		
EPRE ratio of PBC		1	1, 2, 0, 1, 0, 0		
EPRE ratio of PBCI		1			
EPRE ratio of PDC					
EPRE ratio of PDC	_	1			
PDCCH DMRS	51110	dB			0
EPRE ratio of PDS0	CH_DMRS to SSS				•
EPRE ratio of PDS0					
PDSCH DMRS					
EPRE ratio of OCN	G DMRS to SSS				
EPRE ratio of OCN					
N <sub>oc</sub> Note2		dBm/15 KHz	1, 2, 3, 4, 5, 6	-106	
		dBm/SCS	1, 2, 4, 5		-106
Noc <sup>Note2</sup>			3, 6		-103
Ê <sub>s</sub> /N <sub>oc</sub>		dB	1, 2, 3, 4, 5, 6	18	-2
Ês/Iot <sup>Note3</sup>		dB	1, 2, 3, 4, 5, 6	18	<u>-2</u>
SS-RSRP <sup>Note3</sup>		dBm/SCS	1, 2, 4, 5	-88	-108
		1	3, 6	-85	-105
SSB RP <sup>Note3</sup>		dBm/SCS	1, 2, 4, 5	-88	-108
<del>: :-</del>		1	3, 6	-85	-105
		dBm/9.36	1, 2, 4, 5	-59.98	-75.92
IoNote3		MHz			
		dBm/38.16 MHz	3, 6	-53.88	-69.82
Propagation condition	on		1, 2, 3, 4, 5, 6	ET	DLA30
Antenna Configurat Matrix			1, 2, 3, 4, 5, 6		2 Low
		L	<u> </u>		

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

Note 3:  $\hat{E}_s/I_{ot}$ , SS-RSRP, SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table A.6.6.3.1.1-4: E-UTRAN neighbour cell specific test parameters for SA inter-RAT E-UTRAN event triggered reporting in non-DRX with PCell in FR1

Parameter	Unit	Configuration	Cell 2	
			T1	T2
RF channel number		1, 2, 3, 4, 5, 6	1	
Duplex mode		1, 2, 3	FDD	

		4, 5, 6	TDD		
TDD special subframe		4, 5, 6	6		
configuration <sup>Note1</sup>		., 0, 0	-		
TDD uplink-downlink		4, 5, 6	1		
configuration <sup>Note1</sup>		,, ,, ,	-		
BW <sub>channel</sub>	MHz	1, 2, 3, 4, 5, 6	5 MHz: N <sub>RB.</sub>	c = 25	
_ : · · · · · · · · · · · · · · · · · ·		,, =, =, =, =, =	10 MHz: N <sub>RB</sub>		
			20 MHz: N <sub>RB</sub> ,		
PDSCH parameters:		1, 2, 3	5 MHz: R.7		
DL Reference Measurement		, _, -,	10 MHz: R.3		
Channel <sup>Note2</sup>			20 MHz: R.6		
		4, 5, 6	5 MHz: R.4		
		,, ,, ,	10 MHz: R.0		
			20 MHz: R.3		
PCFICH/PDCCH/PHICH		1, 2, 3	5 MHz: R.11		
parameters:		, -, -	10 MHz: R.6		
DL Reference Measurement			20 MHz: R.1		
Channel <sup>Note2</sup>		4, 5, 6	5 MHz: R.11		
		,, ,, ,	10 MHz: R.6		
			20 MHz: R.10 TDD		
OCNG Patterns <sup>Note2</sup>		1, 2, 3	5 MHz: OP.20 FDD		
		, ,	10 MHz: OP.10 FDD		
			20 MHz: OP.17 FDD		
		4, 5, 6	5 MHz: OP.9		
		, ,	10 MHz: OP.	1 TDD	
			20 MHz: OP.	7 TDD	
PBCH RA		1, 2, 3, 4, 5, 6			
PBCH RB					
PSS RA					
SSS RA					
PCFICH RB					
PHICH RA					
PHICH RB	dB		0		
PDCCH RA					
PDCCH RB					
PDSCH RA					
PDSCH RB					
OCNG RA <sup>Note3</sup>					
OCNG RB <sup>Note3</sup>					
Noc <sup>Note4</sup>	dBm/15kHz	1, 2, 3, 4, 5, 6	-106		
Ês/Noc	dB	1, 2, 3, 4, 5, 6	-Infinity	19	
Ês/lot <sup>Note5</sup>	dB	1, 2, 3, 4, 5, 6	-Infinity	19	
RSRP <sup>Note5</sup>	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-87	
SCH RP <sup>Note5</sup>	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-87	
lo <sup>Note5</sup>	dBm/9MHz	1, 2, 3, 4, 5, 6	-78.22+10log (N <sub>RB,c</sub> /50)	-59.16+10log (N <sub>RB,c</sub> /50)	
Propagation Condition		1, 2, 3, 4, 5, 6	ETU70		
Antenna Configuration and		1, 2, 3, 4, 5, 6	1x2 Low		
Correlation Matrix		, _, -, ., 0,			

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].

Note 5:  $\hat{E}_s$ /I<sub>ot</sub>, RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.

Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.

# A.6.6.3.1.2 Test Requirements

The UE shall send one Event B2 triggered measurement report for Cell 2 to the PCell, with a measurement reporting delay less than 3.84s from the start of period T2. The measurement reporting delay is defined as the time from the beginning of time period T2 to the moment when the UE sends the measurement report on PUSCH.

The UE shall not send event-triggered measurement reports as long as the reporting criteria is not fulfilled.

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

# A.6.6.3.2 SA NR - E-UTRAN event-triggered reporting in DRX in FR1

# A.6.6.3.2.1 Test Purpose and Environment

The purpose of this set of tests is to verify that the UE makes correct event-triggered reporting of inter-RAT E-UTRAN measurements when operating in standalone (SA) operation with PCell in FR1 when DRX is used. This test shall partly verify the cell search and measurement requirements in Clauses 9.4.2 and 9.4.3. There are two test cases. In test 1 the UE shall be configured with DRX cycle of 40 ms. In test 2 the UE shall be configured with DRX cycle of 640 ms.

In each test there are two cells: Cell 1 and Cell 2. Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN inter-RAT neighbour cell. In the measurement control information from the PCell it is indictated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter RAT neighbour becomes better than threshold2) is to be used. Each test consists of two consecutive time periods, with durations T1 and T2, respectively. Prior to the start of time duration T1, the UE shall be fully synchronized to Cell 1. During T1, the UE shall not have any information on Cell 2.

In each test the UE shall be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore the UE shall be allocated with PUSCH resource at every DRX cycle.

Supported test configurations are shown in table A.6.6.3.2.1-1. General test parameters are provided in Table A.6.6.3.2.1-2 below. Test parameters for Cell 1 and Cell 2, valid for both time duration T1 and T2, are provided in Tables A.6.6.3.2.1-3 and A.6.6.3.2.1-4, respectively.

Table A.6.6.3.2.1-1: Supported test configurations in SA inter-RAT E-UTRAN event triggered reporting in DRX with PCell in FR1

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

Table A.6.6.3.2.1-2: General test parameters for SA inter-RAT E-UTRAN event triggered reporting in DRX with PCell in FR1

Parameter	Unit	Test 1 Test 2		Comment
		Value		
NR RF Channel Number		1		1 NR carrier frequency is used in the test
LTE RF Channel Number		2		1 LTE carrier frequency is used in the test
Channel Bandwidth	MHz	As specified	in Tables	
		A.6.6.3.2.1-2	2 and	
		A.6.6.3.2.1-3	3.	
Active cell		Cell 1		Cell 1 is on RF channel number 1
Neighbour cell		Cell 2		Cell 2 is on RF channel number 2
Gap Pattern Id		0		As specified in Clause Table 9.1.2-1. Per-UE
				gap pattern.
NR measurement quantity		SS-RSRP		Measurement quantity for Cell 1
Inter-RAT E-UTRAN		RSRP		Measurement quantity for Cell 2
measurement quantity				·
b2-Threshold1	dBm	Note 1		SS-RSRP threshold for SS-RSRP
				measurement on cell1 for event B2
b2-Threshold2EUTRA	dBm	-97		E-UTRAN RSRP threshold for SS-RSRP
				measurement on cell1 for event B2
Hysteresis	dB	0		
TimeToTrigger	S	0		
Filter coefficient		0		L3 filtering is not used
DRX		DRX.1	DRX.2	DRX cycle configurations DRX.1 and DRX.2
				are defined in Table A.3.3.1-1 and Table
				A.3.3.2-1 respectively.
T1	S	5	<u></u>	
T2	S	5	15	
Note 1: Values are define	ed in Table	A.6.6.3.2.1-3		

Table A.6.6.3.2.1-3: PCell specific test parameters for SA inter-RAT E-UTRA event triggered reporting in DRX with PCell in FR1

Parameter		Unit	Configuration		Cell 1
			_	T1	T2
RF channel number	r		1, 2, 3, 4, 5, 6	1	
Duplex mode			1, 2, 3		FDD
•			4, 5, 6		TDD
TDD Configuration	SCS=15 KHz		2, 5	TDE	Conf.1.1
	SCS=30 KHz		3, 6	TDE	Conf.2.1
BW <sub>channel</sub>		MHz	1, 4	10: N <sub>RB</sub>	c = 52 (FDD)
			2, 5	10: N <sub>RB</sub>	c = 52 (TDD)
			3, 6	40: N <sub>RB,</sub>	= 106 (TDD)
PDSCH reference	measurement		1, 4	SR	1.1 FDD
channel			2, 5	SR.1.1 TDD	
			3, 6	SR.2.1 TDD	
CORSET reference	e channel		1, 4	CR.1.1 FDD	
			2, 5	CR.1.1 TDD	
			3, 6	CR	.2.1 TDD
BWP	Initial DL BWP		1, 2, 3, 4, 5, 6	DL	3WP.0.1
configurations	Dedicated DL BWP		1, 2, 3, 4, 5, 6	DL	3WP.1.1
	Initial UL BWP		1, 2, 3, 4, 5, 6	UL	3WP.0.1
	Dedicated UL BWP		1, 2, 3, 4, 5, 6	UL	3WP.1.1
OCNG pattern <sup>Note1</sup>	OCNG pattern <sup>Note1</sup>		1, 2, 3, 4, 5, 6		OP.1
SMTC configuratio	n		1, 2, 3, 4, 5, 6	S	MTC.1
SSB configuration			1, 2, 4, 5	SS	B.1 FR1
-			3, 6	SS	B.2 FR1
b2-Threshold1		dBm	1, 2, 4, 5	-98	

		3, 6		-95
EPRE ratio of PSS to SSS				
EPRE ratio of PBCH DMRS to SSS	1			
EPRE ratio of PBCH to PBCH_DMRS				
EPRE ratio of PDCCH DMRS to SSS	1			
EPRE ratio of PDCCH to				
PDCCH_DMRS	dB	1, 2, 3, 4, 5, 6		0
EPRE ratio of PDSCH_DMRS to SSS				
EPRE ratio of PDSCH to				
PDSCH_DMRS				
EPRE ratio of OCNG DMRS to SSS				
EPRE ratio of OCNG to OCNG DMRS				
N <sub>oc</sub> Note2	dBm/15 KHz	1, 2, 3, 4, 5, 6	-106	
NocNote2	dBm/SCS	1, 2, 4, 5		-106
		3, 6		-103
Ê <sub>s</sub> /N <sub>oc</sub>	dB	1, 2, 3, 4, 5, 6	18	-2
Ês/Iot <sup>Note3</sup>	dB	1, 2, 3, 4, 5, 6	18	-2
SS-RSRP <sup>Note3</sup>	dBm/SCS	1, 2, 4, 5	-88	-108
		3, 6	-85	-105
SSB_RP <sup>Note3</sup>	dBm/SCS	1, 2, 4, 5	-88	-108
		3, 6	-85	-105
	dBm/9.36	1, 2, 4, 5	-59.98	-75.92
IoNote3	MHz			
10	dBm/38.16	3, 6	-53.88	-69.82
	MHz			
Propagation condition		1, 2, 3, 4, 5, 6	ETDLA30	
Antenna Configuration and Correlation Matrix		1, 2, 3, 4, 5, 6	1)	2 Low

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

Note 3: Ê<sub>s</sub>/I<sub>ot</sub>, SS-RSRP, SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table A.6.6.3.2.1-4: E-UTRAN neighbour cell specific test parameters for SA inter-RAT E-UTRAN event triggered reporting in DRX with PCell in FR1

Parameter	Unit	Configuration	Cell 2			
			T1	T2		
RF channel number		1, 2, 3, 4, 5, 6	2			
Duplex mode		1, 2, 3	FDD			
		4, 5, 6	TDD			
TDD special subframe configuration <sup>Note1</sup>		4, 5, 6	6	6		
TDD uplink-downlink configuration <sup>Note1</sup>		4, 5, 6	1	1		
BW <sub>channel</sub>	MHz	1, 2, 3, 4, 5, 6	5 MHz: N <sub>RB,</sub>	= 25		
			10 MHz: N <sub>RB</sub>	,c = 50		
			20 MHz: N <sub>RB,</sub>	c = 100		
PDSCH parameters:		1, 2, 3	5 MHz: R.7	FDD		
DL Reference Measurement			10 MHz: R.3	FDD		
Channel <sup>Note2</sup>			20 MHz: R.6	FDD		
		4, 5, 6	5 MHz: R.4	TDD		
			10 MHz: R.0	TDD		
			20 MHz: R.3	TDD		

PCFICH/PDCCH/PHICH		1, 2, 3	5 MHz: R.1	1 FDD	
parameters:			10 MHz: R.6 FDD		
DL Reference Measurement			20 MHz: R.10 FDD		
Channel <sup>Note2</sup>		4, 5, 6	5 MHz: R.1	1 TDD	
			10 MHz: R.	6 TDD	
			20 MHz: R.10 TDD		
OCNG Patterns <sup>Note2</sup>		1, 2, 3	5 MHz: OP.20 FDD		
			10 MHz: OP.		
			20 MHz: OP.	17 FDD	
		4, 5, 6	5 MHz: OP.	9 TDD	
			10 MHz: OP	– –	
			20 MHz: OP	.7 TDD	
PBCH_RA					
PBCH_RB					
PSS_RA					
SSS_RA					
PCFICH_RB					
PHICH_RA					
PHICH_RB	dB	1, 2, 3, 4, 5, 6	0		
PDCCH_RA					
PDCCH_RB					
PDSCH_RA					
PDSCH RB					
OCNG RA <sup>Note3</sup>					
OCNG RB <sup>Note3</sup>					
N <sub>oc</sub> Note4	dBm/15kHz	1, 2, 3, 4, 5, 6	-106		
Ê <sub>s</sub> /N <sub>oc</sub>	dB	1, 2, 3, 4, 5, 6	-Infinity	19	
Ê <sub>s</sub> /I <sub>ot</sub> <sup>Note5</sup>	dB	1, 2, 3, 4, 5, 6	-Infinity	19	
RSRP <sup>Note5</sup>	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-87	
SCH_RPNote5	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-87	
lo <sup>Note5</sup>	dBm/9MHz	1, 2, 3, 4, 5, 6	-78.22+10log (N <sub>RB,c</sub> /50)	-59.16+10log (N <sub>RB,c</sub> /50)	
Propagation Condition Note6		1, 2, 3, 4, 5, 6	ETU70		
Antenna Configuration and Correlation Matrix Note6		1, 2, 3, 4, 5, 6	1x2 Low		

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].

Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.

Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.

Note 5: Ê<sub>s</sub>/I<sub>ot</sub>, RSRP, SCH\_RP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25].

# A.6.6.3.2.2 Test Requirements

In test 1, the UE shall send one Event B2 triggered measurement report for Cell 2 to the PCell, with a measurement reporting delay less than 3.84s from the start of period T2. The measurement reporting delay is defined as the time from the beginning of time period T2 to the moment when the UE sends the measurement report on PUSCH.

In test 2, the UE shall send one Event B2 triggered measurement report for Cell 2 to the PCell, with a measurement reporting delay less than 12.8s from the start of period T2. The measurement reporting delay is defined as the time from the beginning of time period T2 to the moment when the UE sends the measurement report on PUSCH.

The UE shall not send event-triggered measurement reports as long as the reporting criteria is not fulfilled.

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

# A.6.6.4 L1-RSRP measurement for beam reporting

#### A.6.6.4.1 SSB based L1-RSRP measurement when DRX is not used

### A.6.6.4.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5.4.1, with the testing configurations for NR cells in Table A.6.6.4.1.1-1.

Table A.6.6.4.1.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test

Config	Description
1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only	required to be tested in one of the supported test configurations

# A.6.6.4.1.2 Test parameters

There is one cells in the test, the FR1 PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.6.6.4.1.2-1 and Table A.6.6.4.1.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

Table A.6.6.4.1.2-1: General test parameters

Parameter	Config	Unit	Value
SSB GSCN	1~3		freq1
	1		FDD
Duplex mode	2		TDD
	3		TDD
	1		N/A
TDD Configuration	2	]	TDDConf.1.1
	3		TDDConf.2.1
	1		10: N <sub>RB,c</sub> = 52
BW <sub>channel</sub>	2	MHz	10: N <sub>RB,c</sub> = 52
	3		40: N <sub>RB,c</sub> = 106
PDSCH Reference measurement	1		SR.1.1 FDD
channel	2	]	SR.1.1 TDD
Chamer	3		SR.2.1 TDD
RMSI CORESET Reference	1		CR.1.1 FDD
Channel	2		CR.1.1 TDD
Charine	3		CR.2.1 TDD
Dedicated CORESET Reference	1		CCR.1.1 FDD
Channel	2		CCR.1.1 TDD
Charine	3		CCR.2.1 TDD
	1		SSB.3 FR1
SSB configuration	2		SSB.3 FR1
	3		SSB.4 FR1

OCNG Patterns	1~3		OP.1
Initial DWD Configuration	1~3		DLBWP.0.1
Initial BWP Configuration	1~3		ULBWP.0.1
Dedicated PWP configuration	1~3		DLBWP.1.1
Dedicated BWP configuration	1~3		ULBWP.1.1
SMTC configuration	1~3		SMTC.1
	1		TRS.1.1 FDD
TRS Configuration	2		TRS.1.1 TDD
	3		TRS.1.2 TDD
DRX configuration	1~3		Off
reportConfigType	1~3		periodic
reportQuantity	1~3		ssb-Index-RSRP
Number of reported RS	1~3		2
L1-RSRP reporting period	1~3	slot	80
T1	1~3	S	5
T2	1~3	S	1
EPRE ratio of PSS to SSS			
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH			
DMRS			
EPRE ratio of PDCCH DMRS to			
SSS			
EPRE ratio of PDCCH to PDCCH			
DMRS	1~3	dB	0
EPRE ratio of PDSCH DMRS to	1 0	QD.	
SSS			
EPRE ratio of PDSCH to PDSCH			
DMRS			
EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>			
EPRE ratio of OCNG to OCNG			
DMRS Note 1			
Propagation condition	1~3		AWGN

Table A.6.6.4.1.2-2: SSB specific test parameters

Parameter Config Unit		SSB#0		B#0	SSB#1	
Parameter	Coming	Onit	T1	T2	T1	T2
$N_{oc}^{}$ Note2	1~3	dBm/15kHz	-94.65			
$N_{oc}$ Note2	1,2	1,2 -94.65 dBm/SSB SCS				
1 voc	3	dbiii/33b 3C3	-91.65			
$\hat{\mathrm{E}}_{_{\mathrm{s}}}/\mathrm{I}_{_{\mathrm{ot}}}$	1~3	dB	0	0	-Infinity	3
SSB RSRP Note3	1,2	dBm/SSB SCS	-94.65	-94.65	-Infinity	-91.65
COBTON	3	dBilli/OOB OOO	-91.65	-91.65	-Infinity	-88.65
lo Note3	1,2	dBm/9.36 MHz	-63.69	-63.69	-66.70	-61.93
10	3	dBm/38.16 MHz	-57.59	-57.59	-60.61	-55.84

$\hat{E}_s/N_{oc}$	1~3	dB	0	0	-Infinity	3
Note 1: The T2.	1 1					
		cells and noise sources no s and time and shall be m	•			
$N_o$	to be fulfilled.					
	RP and Io levels hattable parameters the	we been derived from otherselves.	er paramete	ers for info	rmation pui	poses.

# A.6.6.4.1.3 Test Requirements

The UE shall send L1-RSRP report every 80 slots. No later than 640ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1 while meeting the accuracy requirements as defined in Clause 10.1.19.1. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.6.6.4.2 SSB based L1-RSRP measurement when DRX is used

#### A.6.6.4.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5.4.1, with the testing configurations for NR cells in Table A.6.6.4.2.1-1.

Table A.6.6.4.2.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test

Config	Description
1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only	required to be tested in one of the supported test configurations

#### A.6.6.4.2.2 Test parameters

There is one cells in the test, the FR1 PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.6.6.4.2.2-1 and Table A.6.6.4.2.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

Table A.6.6.4.2.2-1: General test parameters

Parameter	Config	Unit	Value
SSB GSCN	1~3		freq1
	1		FDD
Duplex mode	2		TDD
	3		TDD

	1		N/A
TDD Configuration			TDDConf.1.1
TDD Configuration	2		
	3		TDDConf.2.1
	1		10: N <sub>RB,c</sub> = 52
BWchannel	2	MHz	10: N <sub>RB,c</sub> = 52
	3		40: N <sub>RB,c</sub> = 106
PDSCH Reference measurement	1		SR.1.1 FDD
channel	2		SR.1.1 TDD
Channel	3		SR.2.1 TDD
DMOLOODEOUT D. (	1		CR.1.1 FDD
RMSI CORESET Reference	2		CR.1.1 TDD
Channel	3		CR.2.1 TDD
D !!	1		CCR.1.1 FDD
Dedicated CORESET Reference	2		CCR.1.1 TDD
Channel	3		CCR.2.1 TDD
	1		SSB.3 FR1
SSB configuration	2		SSB.3 FR1
	3		SSB.4 FR1
OCNG Patterns	1~3		OP.1
	_		DLBWP.0.1
Initial BWP Configuration	1~3		ULBWP.0.1
			DLBWP.1.1
Dedicated BWP configuration	1~3		ULBWP.1.1
SMTC configuration	1~3		SMTC.1
Civi o comigaration	1		TRS.1.1 FDD
TRS Configuration	2		TRS.1.1 TDD
The comigaration	3		TRS.1.2 TDD
DRX configuration	1~3		DRX.3
reportConfigType	1~3		periodic
reportQuantity	1~3		ssb-Index-RSRP
Number of reported RS	1~3		2
L1-RSRP reporting period	1~3	slot	80
T1	1~3		5
T2	1~3	S S	1
EPRE ratio of PSS to SSS	11-5	3	· · · · · · · · · · · · · · · · · · ·
EPRE ratio of PBCH DMRS to SSS	-		
EPRE ratio of PBCH to PBCH	4		
EPRE ratio of PDCCH DMRS to	4		
SSS			
EPRE ratio of PDCCH to PDCCH			
DMRS	1~3	dР	0
EPRE ratio of PDSCH DMRS to	] 1~3	dB	U
SSS			
EPRE ratio of PDSCH to PDSCH	1		
DMRS			
EPRE ratio of OCNG DMRS to	]		
SSS <sup>Note 1</sup>			
EPRE ratio of OCNG to OCNG			
DMRS Note 1			
Propagation condition	1~3		AWGN

Downwoodow	Canfin	Confin Unit	SS	B#0	SSI	B#1
Parameter Config Unit		T1	T2	T1	T2	
$N_{oc}^{ m Note2}$	1~3	dBm/15kHz		-94	.65	
$N_{oc}$ Note2	1,2	1,2 -94.65				
TV <sub>oc</sub>	3	dBm/SSB SCS	-91.65			
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	1~3	dB	0	0	-Infinity	3
SSB RSRP Note3 1,2		dBm/SSB SCS	-94.65	-94.65	-Infinity	-91.65
COBTON	3		-91.65	-91.65	-Infinity	-88.65
lo <sup>Note3</sup>	1,2	dBm/9.36 MHz	-63.69	-63.69	-66.70	-61.93
10	3	dBm/38.16 MHz	-57.59	-57.59	-60.61	-55.84
$\hat{E}_{s}/N_{ac}$	1~3	dB	0	0	-Infinity	3

Table A.6.6.4.2.2-2: SSB specific test parameters

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

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

#### A.6.6.4.2.3 Test Requirements

The UE shall send L1-RSRP report every 80 slots. No later than 640ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1 while meeting the accuracy requirements as defined in Clause 10.1.19.1. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.6.6.4.3 CSI-RS based L1-RSRP measurement when DRX is not used

#### A.6.6.4A.6.6.4.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5.4.2, with the testing configurations for NR cells in Table A.6.6.4.3.1-1.

Table A.6.6.4.3.1-1: Applicable NR configurations for FR1 CSI-RS based L1-RSRP test

Config	Description			
1 NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode				
2 NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mod				
3 NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode				
Note: The UE is only r	equired to be tested in one of the supported test configurations			

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

# A.6.6.4.3.2 Test parameters

There is one cells in the test, the FR1 PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.6.6.4.3.2-1 and Table A.6.6.4.3.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the CSI-RS and report aperiodically. The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-RSRP on aperiodic CSI-RS resources. UE is also configured to measure L1-RSRP based on SSB. After 80ms from the beginning of the test, the DCI trigger comes in slot n (1 Config 1,2 and 8 for Config 3) of a frame and UE provides the report back based on the reporting configuration as defined in Table A.6.6.4.3.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM and BFD based on the SSBs.

Table A.6.6.4.3.2-1: General test parameters

Parameter	Config	Unit	Value
SSB GSCN	1~3		freq1
	1		FDD
Duplex mode	2		TDD
	3		TDD
	1		N/A
TDD Configuration	2		TDDConf.1.1
	3		TDDConf.2.1
	1		10: N <sub>RB,c</sub> = 52
BW <sub>channel</sub>	2	MHz	10: N <sub>RB,c</sub> = 52
	3		40: N <sub>RB,c</sub> = 106
PDSCH Reference measurement	1		SR.1.1 FDD
channel	2		SR.1.1 TDD
Chamile	3		SR.2.1 TDD
	1		CR.1.1 FDD
RMSI CORESET Reference Channel	2		CR.1.1 TDD
	3		CR.2.1 TDD
Dedicated CORESET Reference	1		CCR.1.1 FDD
Channel	2		CCR.1.1 TDD
Charmer	3		CCR.2.1 TDD
	1		SSB.3 FR1
SSB configuration	2		SSB.3 FR1
	3		SSB.4 FR1
	1		CSI-RS 1.3 FDD
CSI-RS configuration	2		CSI-RS 1.3 TDD
	3		CSI-RS 2.3 TDD
OCNG Patterns	1~3		OP.1
	1		TRS.1.1 FDD
TRS Configuration	2		TRS.1.1 TDD
	3		TRS.1.2 TDD

Initial BWP Configuration	1~3		DLBWP.0.1
Initial BWI Configuration	1-3		ULBWP.0.1
Dedicated BWP configuration	1~3		DLBWP.1.1
Dedicated BVVF configuration	1/3		ULBWP.1.1
SMTC configuration	1~3		SMTC.1
DRX configuration	1~3		Off
reportConfigType	1~3		aperiodic
reportQuantity	1~3		cri-RSRP
Number of reported RS	1~3		2
qcl-Info	1~3		SSB#0 for resource#0
qci-iiiio	1~3		SSB#1 for resource#1
reportSlotOffsetList	1~3	slots	26
T1	1~3	s	5
EPRE ratio of PSS to SSS			
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH			
DMRS			
EPRE ratio of PDSCH DMRS to SSS	1~3	dB	0
EPRE ratio of PDSCH to PDSCH	]		
DMRS			
EPRE ratio of OCNG DMRS to			
SSS <sup>Note 1</sup>			
EPRE ratio of OCNG to OCNG DMRS			
Note 1			
Propagation condition	1~3		AWGN
N-4- 1. OCNC -1-11111-41-4	1 41 11	C 11 11	4 1 . 1

Table A.6.6.4.3.2-2: CSI-RS specific test parameters

Parameter	Config	Unit	CSI-RS#0	CSI-RS#1		
$N_{oc}$ Note1	1~3	dBm/15kHz	-94.65			
λ/ Note1	1,2	dBm/SSB SCS	-94.65			
$N_{oc}$ Note1	3	ubili/33b 3C3	-91	.65		
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	1~3	dB	0	3		
CSI-RS RSRP	1,2	dBm/SSB SCS	-94.65	-91.65		
Note2	3	dbiii/33b 3C3	-94.65 S -94.65 O -94.65 S -91.65 Z -63.69	-88.65		
lo Note2	1,2	dBm/9.36 MHz	-63.69	-61.93		
10	3	dBm/38.16 MHz	-57.59	-55.84		

$\hat{E}_s/N_{oc}$	1~3	dB	0	3
		ells and noise sources no		
consta	nt over subcarriers	s and time and shall be m	odelled as AVVGN of a	ppropriate power for
$N_{oc}$ t	o be fulfilled.			
Note 3: CSI-RS	RSRP and Io leve	ls have been derived fron	n other parameters for	information
purposes. They ar	re not settable para	ameters themselves.		

#### A.6.6.4.3.3 Test Requirements

After 80ms from the beginning of the test, the UE shall send L1-RSRP report at slot 26 from the reception of DCI triggering the L1-RSRP measurement. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1 while meeting the accuracy requirements defined in 10.1.20.1.

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

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.6.6.4.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5.4.2, with the testing configurations for NR cells in Table A.6.6.4.4.1-1.

Table A.6.6.4.4.1-1: Applicable NR configurations for FR1 CSI-RS based L1-RSRP test

C	onfig	Description	
	1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	
	2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	
	3	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode	
Note:	The UE is only re	equired to be tested in one of the supported test configurations	

#### A.6.6.4.4.2 Test parameters

There is one cells in the test, the FR1 PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.6.6.4.4.2-1 and Table A.6.6.4.4.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the CSI-RS and report aperiodically. The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-RSRP on aperiodic CSI-RS resources. UE is also configured to measure L1-RSRP based on SSB. After 80ms from the beginning of the test, the DCI trigger comes in slot n (1 Config 1,2 and 8 for Config 3) of a frame and UE provides the report back based on the reporting configuration as defined in Table A.6.6.4.4.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM and BFD based on the SSBs.

Table A.6.6.4.4.2-1: General test parameters

Parameter	Config	Unit	Value
SSB GSCN	1~3		freq1
	1		FDD
Duplex mode	2		TDD
	3		TDD

	1		N/A
TDD Configuration	2	_	TDDConf.1.1
122 cenngaration	3		TDDConf.2.1
	1		10: N <sub>RB,c</sub> = 52
BW <sub>channel</sub>	2	MHz	10: N <sub>RB,c</sub> = 52
	3		40: N <sub>RB,c</sub> = 106
DDCCII Deference reconstruction	1		SR.1.1 FDD
PDSCH Reference measurement channel	2		SR.1.1 TDD
Channel	3		SR.2.1 TDD
	1		CR.1.1 FDD
RMSI CORESET Reference Channel	2		CR.1.1 TDD
	3		CR.2.1 TDD
Dedicated CORECET Reference	1		CCR.1.1 FDD
Dedicated CORESET Reference   Channel	2		CCR.1.1 TDD
Channel	3		CCR.2.1 TDD
	1		SSB.3 FR1
SSB configuration	2		SSB.3 FR1
_	3		SSB.4 FR1
	1		CSI-RS 1.3 FDD
CSI-RS configuration	2		CSI-RS 1.3 TDD
	3		CSI-RS 2.3 TDD
OCNG Patterns	1~3		OP.1
	1		TRS.1.1 FDD
TRS Configuration	2		TRS.1.1 TDD
	3	MHz  10: N <sub>RB,c</sub> = 52  40: N <sub>RB,c</sub> = 106  SR.1.1 FDD  SR.2.1 TDD  CR.1.1 FDD  CR.1.1 FDD  CR.2.1 TDD  CR.2.1 TDD  CCR.1.1 FDD  CCR.1.1 FDD  CCR.1.1 FDD  CCR.2.1 TDD  CCR.2.1 TDD  CCR.3 FR1  SSB.3 FR1  SSB.3 FR1  SSB.4 FR1  CSI-RS 1.3 FDD  CSI-RS 1.3 TDD  CSI-RS 2.3 TDD  TRS.1.1 FDD  TRS.1.1 FDD  TRS.1.1 FDD  TRS.1.2 TDD  DLBWP.0.1  ULBWP.0.1  ULBWP.1.1  ULBWP.1.1  SSB.3  AB  SMTC.1  BA  SMTC.1  BA  SSB#0 for resource	TRS.1.2 TDD
Initial BWP Configuration	1~3		
Dedicated BWP configuration	1~3		DLBWP.1.1
SMTC configuration	1~3		
DRX configuration	1~3		
reportConfigType	1~3		= : : : : :
reportQuantity	1~3		•
Number of reported RS	1~3		
·			SSB#0 for resource#0
qcl-Info	1~3		SSB#1 for resource#1
	<u> </u>	L	332// 101 1000d100#1

reportSlotOffsetList	1~3	slots	26
T1	1~3	S	5
EPRE ratio of PSS to SSS			
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH			
DMRS			
EPRE ratio of PDSCH DMRS to SSS	1~3	dB	0
EPRE ratio of PDSCH to PDSCH			
DMRS			
EPRE ratio of OCNG DMRS to			
SSS <sup>Note 1</sup>			
EPRE ratio of OCNG to OCNG DMRS			
Note 1			
Propagation condition	1~3		AWGN
N 4 1 00NO 1 111 1 1 1 1 4	1 /1 11	C 11 11	. 1 1 1

Table A.6.6.4.4.2-2: CSI-RS specific test parameters

Parameter	Config	Unit	CSI-RS#0	CSI-RS#1
$N_{oc}$ Note1	1~3	dBm/15kHz	-94	.65
$N_{oc}^{}$ Note1	1,2	dBm/SSB SCS	-94	.65
TV oc	3	dbiii/33b 3C3	-94.65 -94.65 -91.65 0 -94.65 -91.65 -91.65 -91.65 -91.65 -91.65 -63.69 -61.93	.65
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	1~3	dB	0	3
CSI-RS RSRP	1,2	dBm/SSB SCS	-94.65	-91.65
Note2	3	dbiii/oob ooo	dBm/15kHz -94.65  dBm/SSB SCS -91.65  dB 0 -94.65  dBm/SSB SCS -91.65  dBm/SSB SCS -91.65 -91.65 -91.65 -91.65	-88.65
lo <sup>Note2</sup>	1,2	dBm/9.36 MHz	-63.69	-61.93
10	3	dBm/38.16 MHz	-57.59	-55.84
$\hat{E}_s/N_{oc}$	1~3	dB	0	3

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

Note 3: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

# A.6.6.4.4.3 Test Requirements

After 80ms from the beginning of the test, the UE shall send L1-RSRP report at slot 26 from the reception of DCI triggering the L1-RSRP measurement. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1 while meeting the accuracy requirements defined in 10.1.20.1.

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

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.6.6.4.4 CSI-RS based L1-RSRP measurement when DRX is used

Editor's Note: to be added based on A.6.6.3.3.

# A.6.7 Measurement Performance requirements

# A.6.7.1 SS-RSRP

# A.6.7.1.1 SA: intra-frequency case measurement accuracy with FR1 serving cell and FR1 target cell

# A.6.7.1.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clauses 10.1.2.1.1 and 10.1.2.1.2 for intra-frequency measurements.

# A.6.7.1.1.2 Test parameters

In this set of test cases all cells are on the same carrier frequency. Supported test configurations are shown in table A.6.7.1.1.2-1. Both absolute and relative accuracy of SS-RSRP intra-frequency measurements are tested by using the parameters in A.6.7.1.1.2-2. In all test cases, Cell 1 is the PCell, and Cell 2 is the target cell.

Table A.6.7.1.1.2-1: SS-RSRP Intra frequency SS-RSRP supported test configurations

	Config	Description
1		NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2		NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3		NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note:	The UE is only re	equired to be tested in one of the supported test configurations in each supported band

Table A.6.7.1.1.2-2: SS-RSRP Intra frequency test parameters

Parameter		Unit	Tes	Test 1		Test 2		Test 3	
Parai	meter	Unit	Cell 1	Cell 2	Cell 1	Cell 2		Cell 2	
Cell ID	Cell ID			0	489	0	489	0	
SSB ARFCN			fre	q1	fre	q1	fre	q1	
Dunlay mada	Config 1				FD	)D			
Duplex mode	Config 2,3				T	)D			
	Config 1				Not App	olicable			
TDD configuration	Config 2		TDDConf.1.1						
	Config 3		TDDConf.2.1						
	Config 1		10: N <sub>RB,c</sub> = 52						
BW <sub>channel</sub>	Config 2	MHz	10: N <sub>RB,c</sub> = 52						
	Config 3				40: N <sub>RB</sub>	<sub>,c</sub> = 106			
	Config 1		10: N <sub>RB,c</sub> = 52						
BWP BW	Config 2				10: N <sub>RI</sub>	<sub>3,c</sub> = 52			
	Config 3				40: N <sub>RB</sub>	,c = 106			

Downlink initial BWP cor				DLBW	/P.0.1			
Downlink dedicated BW			DLBWP.1.1					
Uplink initial BWP config	uration		ULBWP.0.1					
Uplink dedicated BWP c	onfiguration				ULBV	/P.1.1		
TRS configuration	Config 1		TRS.1. 1 FDD	NA	TRS.1 .1 FDD	NA	TRS.1. 1 FDD	NA
	Config 2		TRS.1. 1 TDD	NA	TRS.1 .1 TDD	NA	TRS.1. 1 TDD	NA
	Config 3		TRS.1. 2 TDD	NA	TRS.1 .2 TDD	NA	TRS.1. 2 TDD	NA
DRX Cycle		ms			Not App	olicable		
	Config 1		SR.1.1 FDD		SR.1.1 FDD		SR.1.1 FDD	
PDSCH Reference measurement channel	Config 2		SR.1.1 TDD	_	SR.1.1 TDD	-	SR.1.1 TDD	-
	Config 3		SR2.1 TDD		SR2.1 TDD		SR2.1 TDD	
	Config 1		CR.1.1 FDD		CR.1.1 FDD		CR.1.1 FDD	
RMSI CORESET Reference Channel	Config 2		CR.1.1 TDD	-	CR.1.1 TDD	-	CR.1.1 TDD	-
	Config 3		CR2.1 TDD		CR2.1 TDD		CR2.1 TDD	
	Config 1		CCR.1. 1 FDD		CCR.1. 1 FDD		CCR.1. 1 FDD	
Control channel RMC	Config 2		CCR.1. 1 TDD	_	CCR.1. 1 TDD	-	CCR.1. 1 TDD	-
	Config 3		CCR2.1 TDD		CCR2. 1 TDD		CCR2.1 TDD	
	Config 1		SSB 1 FR1		SSB 1 FR1		SSB 1 FR1	
SSB configuration	Config 2		SSB 1 FR1	_	SSB 1 FR1	-	SSB 1 FR1	-
	Config 3		SSB 2 FR1		SSB 2 FR1		SSB 2 FR1	
	Config 1		SSB.1 FR1	SSB.1 FR1	SSB.1 FR1	SSB.1 FR1	SSB.1 FR1	SSB.1 FR1
SSB configuration	Config 2		SSB.1 FR1	SSB.1 FR1	SSB.1 FR1	SSB.1 FR1	SSB.1 FR1	SSB.1 FR1
	Config 3		SSB.2 FR1	SSB.2 FR1	SSB.2 FR1	SSB.2 FR1	SSB.2 FR1	SSB.2 FR1
Time offset with Cell 2	Config 1	ms	-	3	-	3	-	3
The chock man con Z	Config 2,3	μs	-	3	-	3	-	3
SMTC configuration	Config 1				SM			
Config 2,3					SM			
OCNG Patterns	0 5 40				OCNG p			
PDSCH/PDCCH subcarrier spacing	Config 1,2 Config 3	kHz				KHZ ∕⊔-		
Sassarrior spaoring	Coming o				30k	ίΗz		

EPRF ratio	of PSS to SS	SS									
	EPRE ratio of PBCH DMRS to SSS										
EPRE ratio of PBCH to PBCH DMRS											
	of PDCCH D										
		PDCCH DMRS	dB	0	0	0	0	0	0		
	of PDSCH Do of PDSCH to										
		MRS to SSS(Note 1)									
		OCNG DMRS (Note									
1)		,									
		NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6							-114		
		NR_FDD_FR1_B							3.5		
	Config 1,2	NR_TDD_FR1_C NR_FDD_FR1_D,		-10	ne	_5	38	-1	13		
	Corning 1,2	NR_TDD_FR1_D		- [(	50	-(	00	-11	2.5		
		NR FDD FR1 E,									
		NR_TDD_FR1_E						-1			
		NR_FDD_FR1_G						-1			
$N_{oc}^{ m Note2}$		NR_FDD_FR1_H	dBm/15Kh Z					-11	0.5		
		NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6						-1			
		NR_FDD_FR1_B		Not		-94		-113.5			
	Config 2	NR_TDD_FR1_C						-113			
	Config 3	NR_FDD_FR1_D, NR_TDD_FR1_D		applical	ole <sup>Note 5</sup>	-94		-11	2.5		
		NR FDD FR1 E,									
		NR_TDD_FR1_E						-112			
		NR_FDD_FR1_G						-111			
		NR_FDD_FR1_H						-110.5			
	Config 1,2			-106		-88		Same as Noc/15kHz			
		NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6						-1	11		
Nete2		NR_FDD_FR1_B		dBm/SCS Not applicableNote 5		-91		-110.5			
$N_{oc}^{$		NR_TDD_FR1_C	dBm/SCS					-110			
	Config 3	NR_FDD_FR1_D, NR_TDD_FR1_D						-10	9.5		
		NR_FDD_FR1_E,						-1	ng		
		NR_TDD_FR1_E									
		NR_FDD_FR1_G						-108			
		NR_FDD_FR1_H					I	-10			
	$\hat{\mathbf{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$		dB	2.46	-5.97	2.46	-5.97	-0.01	-4.76		
$\hat{E}_s/N_{oc}$		dB	6	1	6	1	3	0			
		NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6						111.00	114.00		
SS-	Cambi 10	NR_FDD_FR1_B	4D (0.00	400	405	60	0.7	110.50	113.50		
RSRP <sup>Not</sup>	Config 1,2	NR_TDD_FR1_C	dBm/SCS	-100	-105	-82	-87	110.00	113.00		
		NR_FDD_FR1_D, NR_TDD_FR1_D						- 109.50	- 112.50		
		NR_FDD_FR1_E, NR_TDD_FR1_E						109.00	- 112.00		

		NR_FDD_FR1_G						- 108.00	- 111.00	
		NR_FDD_FR1_H						- 107.50	- 110.50	
		NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6						108.00	- 111.00	
		NR_FDD_FR1_B						- 107.50	- 110.50	
		NR_TDD_FR1_C		Not	Not applic			- 107.00	- 110.00	
	Config 3	NR_FDD_FR1_D, NR_TDD_FR1_D NR_FDD_FR1_E,		applica ble <sup>Note 5</sup>	able <sup>Not</sup>	-85	-90	106.50	109.50	
		NR_TDD_FR1_E						106.00	109.00	
		NR_FDD_FR1_G						- 105.00	- 108.00	
		NR_FDD_FR1_H						- 104.50	- 107.50	
	Config 1,2	NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6						-80	.03	
		NR_FDD_FR1_B	dBm/ 9.36MHz						.53	
		NR_TDD_FR1_C							.03	
		NR_FDD_FR1_D, NR_TDD_FR1_D		70.00		-52.09		-78		
		NR_FDD_FR1_E, NR_TDD_FR1_E							.03	
		NR_FDD_FR1_G							.03	
Io <sup>Note3</sup>		NR_FDD_FR1_H							.53	
		NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6						-73	.94	
		NR_FDD_FR1_B						-73		
	Config 3	NR_TDD_FR1_C NR_FDD_FR1_D,	dBm/		ot	-51	.99	-72 -72		
	3 -	NR_TDD_FR1_D	38.16MHz	applicat	DIEMORE 3-		-			
		NR_FDD_FR1_E, NR_TDD_FR1_E						-71	.94	
		NR_FDD_FR1_G							-70.94	
Drop	n oond:::-:-	NR_FDD_FR1_H				A \ A \	CNI	-70	.44	
	on condition onfiguration		-			AW 1x				
/ witchind to	o.mga.adon		1	1		17	<b>`</b>			

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

Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: Subtest 1 is not used when testing with 30kHz SSB SCS.

Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification

# A.6.7.1.1.3 Test Requirements

The SS-RSRP measurement accuracy for cell 1 and cell 2 shall fulfil absolute requirement in clause 10.1.2.1.1 and relative requirement in clause 10.1.2.1.2.

# A.6.7.1.2 SA inter-frequency case measurement accuracy with FR1 serving cell and FR1 target cell

#### A.6.7.1.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clauses 10.1.4.1.1 and 10.1.4.1.2 for inter-frequency measurements with the testing configurations for NR cells in Table A.6.7.1.2.1-1.

Table A.6.7.1.2.1-1: Applicable NR configurations for FR1 inter-frequency SS-RSRP accuracy test

	Config	Description
1		NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2		NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3		NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note:	The UE is only red	uired to be tested in one of the supported test configurations in each supported band

#### A.6.7.1.2.2 Test parameters

In this set of test cases there are two cells in the test, PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on a different frequency than the PCell. The test parameters for the Cell 1 and Cell 2 are given in Table A.6.7.1.2.2-1 below. Both absolute and relative accuracy of RSRP inter-frequency measurements are tested by using the parameters in Table A.6.7.1.2.2-1. The inter-frequency measurements are supported by a measurement gap.

Table A.6.7.1.2.2-1: SS-RSRP inter-frequency test parameters

Parameter	Config	Unit	Test 1		Test 2		
Parameter	Config	Offic	Cell 1	Cell 2	Cell 1	Cell 2	
SSB ARFCN	1~3		freq1	freq2	freq1	freq2	
	1		10: N <sub>RB,c</sub> =	= 52	10: N <sub>RB,c</sub>		
BW <sub>channel</sub>	2	MHz	10: N <sub>RB,c</sub> =	- 52	10: N <sub>RB,c</sub>	: = 52	
	3		40: N <sub>RB,c</sub> =	106	40: N <sub>RB,c</sub>	= 106	
	1		FDD		FDE	)	
Duplex mode	2		TDD		TDE	)	
	3		TDD		TDE	)	
	1		N/A		N/A	l	
TDD configuration	2		TDDConf.	.1.1	TDDConf.1.1		
	3		TDDConf.2.1		TDDConf.2.1		
PDSCH Reference	1		SR.1.1 FDD		SR.1.1 FDD		
measurement channel	2		SR.1.1 TDD	-	SR.1.1 TDD	-	
measurement chainer	3		SR.2.1 FDD		SR.2.1 FDD		
RMSI CORESET Reference	1		CR.1.1 FDD	-	CR.1.1 FDD	-	
Channel	2		CR.1.1 TDD	-	CR.1.1 TDD	-	
Charmer	3		CR.2.1 FDD	-	CR.2.1 FDD	-	
Dedicated CORESET	1		CCR.1.1 FDD	-	CCR.1.1 FDD	-	
Reference Channel	2		CCR.1.1 TDD	-	CCR.1.1 TDD	-	
Reference Chairner	3		CCR.2.1 TDD	-	CCR.2.1 TDD	-	
	1		SSB.1 FI	R1	SSB.1 FR1		
SSB configuration	2		SSB.1 FI	SSB.1 FR1		FR1	
	3		SSB.2 FR1		SSB.2 FR1		
OCNG Patterns	1~3		OP.1		OP.	1	
TRS configuration	1		TRS.1.1 FDD -		TRS.1.1 FDD		

			<u> </u>			TRS.1.1	
		2		TRS.1.1 TDD		TDD	
				TRS.1.2 TDD		TRS.1.2 TDD	
Initial BWP	Initial BWP Configuration			DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1	
Dedicated B	BWP configuration	1~3		DLBWP.1 ULBWP.1	1.1	DLBWP.1.1 ULBWP.1.1	
SMTC conf	iguration	1~3		SMTC.	1	SMTC	0.1
Time offset and Cell 2	between Cell 1	1~3	μs	3		3	
	of PSS to SSS						
EPRE ratio o	of PBCH DMRS to						
	of PBCH to PBCH						
	of PDCCH DMRS to						
EPRE ratio o	of PDCCH to PDCCH	4.0	-ID	0			
	of PDSCH DMRS to	1~3	dB	0	0	0	0
	of PDSCH to PDSCH						
DMRS EPRE ratio o	of OCNG DMRS to						
	of OCNG to OCNG						
	NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5			-94.65			-115
	NR_FDD_FR1_B		dBm/15				-114.5
$N_{oc}$ Note2	NR_TDD_FR1_C					$(N_{oc} _{for})$	-114
	NR_FDD_FR1_D, NR_TDD_FR1_D NR_FDD_FR1_E, NR_TDD_FR1_E	1~3	kHz			Channel 2 +8dB)	-113.5
							-113
	NR_FDD_FR1_G						-112
	NR_FDD_FR1_H						-111.5
	NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5						-115
	NR_FDD_FR1_B						-114.5
	NR_TDD_FR1_C	4045		-94.65		$(N_{oc})_{for}$	-114
	NR_FDD_FR1_D, NR TDD FR1 D	1,2,4,5				Channel 2	-113.5
	NR_FDD_FR1_E,					+8dB)	-113
	NR TDD FR1 E NR FDD FR1 G						-112
$N_{oc}$ Note2	NR_FDD_FR1_H		dBm/SS				-111.5
	NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5		B SCS				-112.00
	NR FDD FR1 B						-112.50
	NR_TDD_FR1_C					$(N_{oc})_{for}$	-112.00
	NR_FDD_FR1_D,	3		-91.65		Channel 2	-111.50
	NR_TDD_FR1_D NR_FDD_FR1_E,					+8dB)	-111.00
NR_TDD_FR1_E							
	NR_FDD_FR1_G NR FDD FR1 H						-110.00 -110.50
	$\hat{E}_s/I_{ot}$	1~3	dB	10	10	13	-3
SS-	NR_FDD_FR1_A,	1045	dBm/SC	04.05	1		
RSRP <sup>Note3</sup>	NR_TDD_FR1_A	1,2,4,5	S	-84.65			-118.00

	NR FDD FR1 B						-117.50
	NR TDD FR1 C						-117.00
	NR_FDD_FR1_D,					(RSRP for	
	NR_TDD_FR1_D					Cell 2	-116.50
	NR_FDD_FR1_E, NR_TDD_FR1_E					+25dB)	-116.00
•	NR FDD FR1 G						-115.00
•	NR FDD FR1 H						-114.50
-	NR FDD FR1 A,						-115.00
	NR_TDD_FR1_A						110.00
	NOTE 5						
	NR_FDD_FR1_B						-114.50
	NR_TDD_FR1_C			04.05		(RSRP for	-114.00
	NR_FDD_FR1_D, NR_TDD_FR1_D	3		-81.65		Cell 2 +25dB)	-113.50
-	NR FDD FR1 E,					+23 <b>u</b> B)	-113.00
	NR_TDD_FR1_E						-110.00
	NR_FDD_FR1_G						-112.00
	NR_FDD_FR1_H						-111.50
	NR_FDD_FR1_A,						-85.28
	NR_TDD_FR1_A NOTE 5		dBm/ 9.36MH z				
•	NR FDD FR1 B			-56.28			-84.78
	NR TDD FR1 C					Io for Channel 2 +19.75dB)T	-84.28
	NR_FDD_FR1_D,	1,2,4,5					-83.78
	NR_TDD_FR1_D						
	NR_FDD_FR1_E,						-83.28
	NR_TDD_FR1_E NR_FDD_FR1_G						-82.28
	NR FDD FR1 H						-81.78
Io <sup>Note3</sup>	NR FDD FR1 A,						-79.19
	NR TDD FR1 A						-70.10
	NOTE 5,						
	NR_FDD_FR1_B		ID /				-78.69
	NR_TDD_FR1_C	2	dBm/	50.40		Io for	-78.19
	NR_FDD_FR1_D, NR TDD FR1 D	3	38.16M	-50.19		Channel 2 +19.75dB)T	-77.69
•	NR FDD FR1 E,		Hz			+19.73db)1	-77.19
	NR TDD FR1 E						
	NR_FDD_FR1_G						-76.19
	NR_FDD_FR1_H						-75.69
<u> </u>	$\hat{E}_s/N_{oc}$	1~3	dB	10	10	13	-3
Propag	ation condition	1~3	-	AWGN		AWG	iN
Δntenn	a configuration	1~3		1x2		1x2	

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power

for  $N_{oc}$  to be fulfilled.

Note 3: RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification

# A.6.7.1.2.3 Test Requirements

The SS-RSRP measurement accuracy for Cell 1 and Cell 2 shall fulfil the absolute requirement in clause 10.1.4.1.1 and relative requirement in clause 10.1.4.1.2.

# A.6.7.1.3 Void

# A.6.7.2 SS-RSRQ

# A.6.7.2.1 SA: Intra-frequency measurement accuracy with FR1 serving cell and FR1 target cell

# A.6.7.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in Clause 10.1.7.1.1.

#### A.6.7.2.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configuration are shown in Table A.6.7.2.1.2-1. The absolute accuracy of SS-RSRQ intra-frequency measurement is tested by using the parameters in Table A.6.7.2.1.2-2. In all test cases, Cell 1 is the PCell and Cell 2 is the target cell.

Table A.6.7.2.1.2-1: SS-RSRQ Intra frequency SS-RSRQ supported test configurations

	Config Description						
1		NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode					
2		NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode					
3		NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode					
Note:	The UE is only re	The UE is only required to be tested in one of the supported test configurations					

Table A.6.7.2.1.2-2: SS-RSRQ Intra frequency test parameters

Parameter		Unit	Tes	st 1	Test 2		Test 3	
Paramo			Cell 1	Cell 2	Cell 1	Cell 2	Cell 1	Cell 2
SSB ARFCN			fre	q1	fre	q1	fre	q1
Duplex mode	Config 1				FDI			
Вирюх пюче	Config 2,3				TDI			
	Config 1				Not App	licable		
TDD configuration	Config 2				TDDCo	nf.1.1		
	Config 3				TDDCo	nf.2.1		
	Config 1				10: N <sub>RB</sub> ,	c = 52		
BW <sub>channel</sub>	Config 2	MHz	10: N <sub>RB,c</sub> = 52					
	Config 3		40: N <sub>RB,c</sub> = 106					
Gap Pattern ID					0			
	Initial DL BWP				DLBWI	P.0.1		
	Dedicated DL BWP	DLBWP.1.1						
BWP configuration	Initial UL BWP				ULBWI	P.0.1		
	Dedicated UL BWP				ULBWI	P.1.1		
DRX Cycle		ms			Not App	licable		
PDSCH Reference	Config 1		SR.1.1 FDD		SR.1.1 FDD		SR.1. 1 FDD	
measurement channel	Config 2		SR.1.1 TDD	-	SR.1.1 TDD	-	SR.1. 1 TDD	1

		Config 3		SR2.1 TDD		SR2.1 TDD		SR2.1 TDD	
(		Config 1		CR.1.1 FDD		CR.1.1 FDD		CR.1. 1 FDD	
RMSI COR Reference		Config 2		CR.1.1 TDD	-	CR.1.1 TDD	-	CR.1. 1 TDD	
		Config 3		CR.2.1 TDD		CR.2.1 TDD		CR.2. 1 TDD	
		Config 1		CCR.1. 1 FDD		CCR.1. 1 FDD		CCR. 1.1 FDD	
Control Cha	annel RMC	Config 2		CCR.1. 1 TDD	-	CCR.1. 1 TDD	-	CCR. 1.1 TDD	-
		Config 3		CCR.2. 1 TDD		CCR.2. 1 TDD		CCR. 2.1 TDD	
OCNG Pat						OP.			
	leasurement					Not App			
SMTC conf	figuration	Т				SMT			
SSB config	uration	Config 1,2		SSB.1 FR1					
	'	Config 3		SSB.2 FR1					
PDSCH/PD		Config 1,2	kHz		15 kHz				
subcarrier	<u> </u>	Config 3		30kHz					
	of PSS to SS of PBCH DM								
	of PBCH to F								
	of PDCCH D								
	of PDCCH to of PDSCH D	PDCCH DMRS	dB	0	0	0	0	0	0
	of PDSCH to								
		MRS to SSS(Note 1)							
EPRE ratio	of OCNG to	OCNG DMRS (Note							
,		NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6						-1	14
		NR_FDD_FR1_B							3.5
	Config 1,2	NR_TDD_FR1_C NR_FDD_FR1_D,		-8	15	-10	<b>0</b> 1		13
	Comig 1,2	NR_TDD_FR1_D				-1,	01	-11	2.5
		NR_FDD_FR1_E,						-1	12
Noto?		NR_TDD_FR1_E NR_FDD_FR1_G	dBm/15kH						
$N_{oc}^{ m Note2}$		NR_FDD_FR1_H	Z					-111 -110.5	
		NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6						-1	14
		NR_FDD_FR1_B							3.5
	Config 3	NR_TDD_FR1_C NR_FDD_FR1_D,		-91		-			13
		NR_TDD_FR1_D						-11	2.5
		NR_FDD_FR1_E, NR_TDD_FR1_E						-112	

		NR FDD FR1 G						-1	11
		NR_FDD_FR1_H							0.5
$N_{oc}^{$	Config 1,2 Config 3	NR_FDD_FR1_A, NR_TDD_FR1_A NOTE6  NR_FDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D, NR_TDD_FR1_E, NR_TDD_FR1_E NR_FDD_FR1_B NR_FDD_FR1_H NR_FDD_FR1_A, NR_TDD_FR1_A, NR_TDD_FR1_A NOTE6  NR_FDD_FR1_B NR_TDD_FR1_B NR_TDD_FR1_B NR_TDD_FR1_B NR_TDD_FR1_B NR_TDD_FR1_B NR_TDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D, NR_TDD_FR1_D, NR_TDD_FR1_E,	dBm/SCS	-85 -88		-101 -		-114 -113.5 -113 -112.5 -112 -111 -110.5 -111 -110.5 -110 -109.5	
		NR_TDD_FR1_E						-109	
		NR_FDD_FR1_G NR_FDD_FR1_H						-107.5	
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$				-1.76		-4.7		-546	-5.46
$\hat{E}_s/N_{oc}$			dB	3	3	-2.9	-2.9	-4	-4
	Config 1,2	NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6 NR_FDD_FR1_B	dBm/SCS			-103.9	-103.9	-118 -117.5	-118 -117.5
SS-		NR_TDD_FR1_C NR_FDD_FR1_D, NR_TDD_FR1_E, NR_TDD_FR1_E NR_TDD_FR1_E NR_FDD_FR1_G NR_FDD_FR1_H		-82	-82			-117 -116.5 -116 -115 -114.5	-117 -116.5 -116 -115 -114.5
RSRP <sup>Note</sup> 3	Config 3	NR_FDD_FR1_A, NR_TDD_FR1_A NOTE6  NR_FDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D, NR_TDD_FR1_D NR_FDD_FR1_E, NR_TDD_FR1_E NR_FDD_FR1_G NR_FDD_FR1_G NR_FDD_FR1_H		-85	-85	-	-	-115 -114.5 -114 -113.5 -113 -112 -111.5	-115
NR_TDD_F   NOTE 6		NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6  NR_FDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D, NR_TDD_FR1_D NR_FDD_FR1_E, NR_TDD_FR1_E NR_FDD_FR1_G NR_FDD_FR1_G NR_FDD_FR1_H	dB	-14.77	-14.77	-16.76	-16.76	-17.34	-17.34

		NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6						-83.5	
		NR_FDD_FR1_B						-8	33
		NR_TDD_FR1_C						-82	2.5
	Config 1,2	NR_FDD_FR1_D, NR_TDD_FR1_D	dBm/ 9.36MHz	-50		-70		-8	32
		NR_FDD_FR1_E, NR_TDD_FR1_E						-8′	1.5
		NR_FDD_FR1_G						-80.5	
Io <sup>Note3</sup>		NR_FDD_FR1_H						-80	
		NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 6	dBm/	-50		-		-77	7.4
		NR_FDD_FR1_B						-76.9	
	0	NR_TDD_FR1_C						-76.4	
	Config 3	NR_FDD_FR1_D, NR_TDD_FR1_D	38.16MHz					-75.9	
		NR_FDD_FR1_E,						75.4	
		NR_TDD_FR1_E						-75.4	
		NR_FDD_FR1_G						-74.4	
	NR_FDD_FR1_H				I				3.9
Propagatio	Propagation condition		-	AWGN	AWGN	AWGN	AWGN	AWG N	AWG N
Antenna co	nfiguration			1x2	1x2	1x2	1x2	1x2	1x2

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.
- Note 3: SS-RSRQ, SS-RSRP, and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 5: NR operating band groups are as defined in clause 3.5.2.
- Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification

# A.6.7.2.1.3 Test Requirements

The SS-RSRQ measurement accuracy shall fulfil the requirements in clause 10.1.7.1.1.

# A.6.7.2.2 SA Inter-frequency measurement accuracy with FR1 serving cell and FR1 target cell

#### A.6.7.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in Clause 10.1.9.1.1 and 10.1.9.1.2.

#### A.6.7.2.2.2 Test Parameters

In this test case the two cells (i.e., Cell 1 and Cell 2) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table A.6.7.2.2.2-1. Both absolute accuracy and relative accuracy requirements of SS-RSRQ inter-frequency measurement are tested by using test parameters in Table A.6.7.2.2.2-2. In all test cases, Cell 1 is the PCell and Cell 2 is target cell.

Table A.6.7.2.2.2-1: SS-RSRQ Inter frequency SS-RSRQ supported test configurations

	Config	Description
1		NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2		NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3		NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note:	The UE is only	required to be tested in one of the supported test configurations

Table A.6.7.2.2.2: SS-RSRQ Inter frequency test parameters

Parame	Parameter		Test 1		Test 2		Test 3	
		Unit	Cell 1	Cell 2	Cell 1	Cell 2	Cell 1	Cell 2
SSB ARFCN	Config 1		freq1	freq2	freq1 FD	freq2	freq1	freq2
Duplex mode	Config 2,3	-			TD			
	Config 1		Not Applicable					
TDD configuration	Config 2	1			TDDC			
	Config 3	1			TDDC	onf.2.1		
	Config 1				10: N <sub>RE</sub>	3,c = 52		
BWchannel	Config 2	MHz			10: N <sub>RE</sub>	<sub>3,c</sub> = 52		
	Config 3	]			40: N <sub>RB</sub> ,	c = 106		
Gap pattern ID	Config 1,2,3				C	)		
	Config 1		10: N <sub>RB,c</sub> = 52					
BWP BW	Config 2				10: N <sub>RE</sub>	<sub>3,c</sub> = 52		
	Config 3				40: NRB	,c = 106		
DRX Cycle		ms			Not App	olicable		
	Config 1,4		SR.1.1 FDD		SR.1.1 FDD		SR.1.1 FDD	
PDSCH Reference measurement channel	Config 2,5		SR.1.1 TDD	-	SR.1.1 TDD	-	SR.1.1 TDD	-
	Config 3,6		SR2.1 TDD		SR2.1 TDD		SR2.1 TDD	
	Config 1		CR.1.1 FDD	-	R.1.1 FDD	-	CR.1.1 FDD	
RMSI CORESET Reference Channel	Config 2		CR.1.1 TDD		CR.1.1 TDD		CR.1.1 TDD	
Gap pattern ID  BWP BW  DRX Cycle  PDSCH Reference measurement channel	Config 3		CR2.1 TDD		CR2.1 TDD		CR2.1 TDD	
	Config 1		CCR.1 .1 FDD		CCR.1. 1 FDD		CCR.1. 1 FDD	
	Config 2		CCR.1 .1 TDD	-	CCR.1. 1 TDD	-	CCR.1. 1 TDD	_
	Config 3		CCR2. 1 TDD		CCR2.1 TDD		CCR2. 1 TDD	
OCNG Patterns					OCNG p	attern 1		
SMTC configuration	Config 1,2				SMTC p	attern 1		
Sivi i C configuration	Config 3	]			SMTC p			
SSB configuration	Config 1,2	1			SSB patter			
222 oormgaradon	Config 3			;	SSB patter			
	Config 1,2	kHz			15 k	(Hz		

PDSCH/PI	OCCH	Config 3				30 k	Н7		
subcarrier					Г	JU N	11 12		
	of PSS to SSS of PBCH DMRS	to 999							
	of PBCH to PBC								
	of PDCCH DMR								
	of PDCCH to PD		dB	0	0	0	0	0	0
	of PDSCH DMR								
	of PDSCH to PD								
	of OCNG DMRS								
EPRE ratio	of OCNG to OCI	NG DMRS (Note 1)							
		NR_FDD_FR1_A NR_TDD_FR1_A NOTE 6						<b>-1</b> 1	16
		NR_FDD_FR1_B						-11:	5.5
λī		NR_TDD_FR1_C						-11	15
$N_{oc}$	Config 1,2	NR_FDD_FR1_D	dBm/15kHz	-80	).18	-10	06		
Note2		NR_TDD_FR1_D						-114	4.5
		NR_FDD_FR1_E							
		NR_TDD_FR1_E						-11	14
		NR_FDD_FR1_G						-11	13
		NR_FDD_FR1_H						-11:	2.5
		NR_FDD_FR1_A							
		NR_TDD_FR1_A							
		NOTE 6							
		NR_FDD_FR1_B							
$N_{oc}$		NR_TDD_FR1_C	,,			440		-11	5
Note2	Config 3	NR_FDD_FR1_D	dBm/15kHz	-86	5.27	-11	13		
		NR_TDD_FR1_D						-114	4.5
		NR_FDD_FR1_E							
		NR_TDD_FR1_E							
		NR_FDD_FR1_G							
		NR_FDD_FR1_H				<del> </del>		-112.5	
		NR_FDD_FR1_A NR TDD FR1 A							
		NOTE 6						14	16
		NR FDD FR1 B							
		NR TDD FR1 C							
	Config 1,2	NR FDD FR1 D		-80	).18	_1(	16	-1	0
	Comig 1,2	NR TDD FR1 D		-00	7.10	-106		_11	15
		NR FDD FR1 E						-11	7.0
		NR TDD FR1 E						-11	4
		NR_FDD_FR1_G				-115 -106 -114.5  -114 -113 -112.5  -116 -115.5 -115 -114 -113 -112.5  -116 -114.5  -114 -113 -112.5  -116 -115.5 -115  -116 -115.5 -115  -116 -115.5 -115  -116 -115.5 -115  -116 -115.5 -115 -115 -116 -115.5 -115 -116 -115.5 -115 -116 -117.5 -117.5 -117.5 -117.5 -117.5 -117.5 -117.5 -17.75 -1.75 -1.75 -1.75 -1.75 -1.75 -1.75 -1.75 -1.75 -1.75 -1.75 -1.75 -1.75			
$N_{oc}$		NR FDD FR1 H	,,						
Note2		NR FDD FR1 A	dBm/15kHz						-
		NR TDD FR1 A							
		NOTE 6						-11	13
		NR_FDD_FR1_B						-111	2.5
		NR_TDD_FR1_C						-11	2
	Config 3	NR_FDD_FR1_D		-83	3.27	-1°	10		
		NR_TDD_FR1_D						-11	1.5
		NR_FDD_FR1_E							
		NR_TDD_FR1_E							
		NR_FDD_FR1_G							
	NR.							-109	9.5
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$			dB	-1	.75	-1.	75	3	-1.75
$\hat{E}_s/N_{oc}$			dB	-1	.75	-1.	75	3	-1.75
SS-		NR FDD FR1 A		·				-	_
RSRPNot	Config 1,2	NR_TDD_FR1_A	dBm/SCS	-81.93	-81.93	-	-		- 117.7
e3	<i>G</i> ,	NOTE 6				107.75	107.75	-113	5
-		•	•						

_		1	T	1	1	1	1	1	,
		NR_FDD_FR1_B						-112.5	- 117.2 5
		NR_TDD_FR1_C						-112	- 116.7 5
		NR_FDD_FR1_D NR_TDD_FR1_D						-111.5	- 116.2 5
		NR_FDD_FR1_E NR_TDD_FR1_E							- 115.7
		NR_FDD_FR1_G						-111	5 - 114.7
		NR_FDD_FR1_H						-110	5 - 114.2
		NR_FDD_FR1_A NR_TDD_FR1_A NOTE 6						-109.5 -110	5 - 114.7 5
		NR_FDD_FR1_B						-109.5	- 114.2 5
		NR_TDD_FR1_C						-109	- 113.7 5
	Config 3	NR_FDD_FR1_D NR_TDD_FR1_D		-85.02	-85.02	- 111.75	- 111.75	-108.5	- 113.2 5
		NR_FDD_FR1_E NR_TDD_FR1_E						-108	- 112.7 5
		NR_FDD_FR1_G						-107	- 111.7 5
		NR_FDD_FR1_H						-106.5	- 111.2 5
		NR_FDD_FR1_A NR_TDD_FR1_A NOTE 6							-
SS-RSRQ <sup>I</sup>	Note3	NR_FDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D NR_TDD_FR1_D	dB	-14.77	-14.77	-40.59	-40.59	12.56T	14.76 T
		NR_FDD_FR1_E NR_TDD_FR1_E NR_FDD_FR1_G NR_FDD_FR1_H							
		NR_FDD_FR1_A NR_TDD_FR1_A NOTE 6						-83.28	- 85.83
		NR_FDD_FR1_B						-82.78	- 85.33
	0 5 40	NR_TDD_FR1_C	JD /000			7-		-82.28	- 84.83
Io <sup>Note3</sup>	Config 1,2	NR_FDD_FR1_D NR_TDD_FR1_D NR_FDD_FR1_E	dBm/SCS		50	-75	.83	-81.78	- 84.33
		NR_TDD_FR1_E						-81.28	83.83
		NR_FDD_FR1_G						-80.28	82.83
		NR_FDD_FR1_H						-79.78	82.33

		NR_FDD_FR1_A NR_TDD_FR1_A NOTE 6						-77.19	- 79.73
		NR_FDD_FR1_B						-76.69	- 79.23
		NR_TDD_FR1_C				-76.73		-76.19	- 78.73
	Config 3	NR_FDD_FR1_D NR_TDD_FR1_D		-50				-75.69	- 78.23
		NR_FDD_FR1_E NR_TDD_FR1_E						-75.19	- 77.73
		NR_FDD_FR1_G						-74.19	- 76.73
		NR_FDD_FR1_H						-73.69	- 76.53
Propagation	Propagation condition		-	AWG N	AWGN	AWGN	AWGN	AWG N	AWG N
Antenna c	Antenna configuration			1x2	1x2	1x2	1x2	1x2	1x2

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.
- Note 3: SS-RSRQ, SS-RSRP, and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 5: NR operating band groups are as defined in clause 3.5.2.
- Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification

#### A.6.7.2.2.3 Test Requirements

The SS-RSRQ measurement accuracy shall fulfil the requirements in clause 10.1.9.1.1 and 10.1.9.1.2.

#### A.6.7.3 SS-SINR

# A.6.7.3.1 SA intra-frequency measurement accuracy with FR1 serving cell and FR1 target cell

#### A.6.7.3.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.12.1.1.

#### A.6.7.3.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configuration are shown in Table A.6.7.3.1.2-1. The absolute accuracy of SS-SINR intra-frequency measurement is tested by using the parameters in Table A.6.7.3.1.2-2. In all test cases, Cell 1 is the PCell and Cell 2 is the target cell.

Table A.6.7.3.1.2-1: SS-SINR Intra frequency SS-SINR supported test configurations

	Config	Description
1		NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2		NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3		NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note:	The UE is only r	equired to be tested in one of the supported test configurations

Table A.6.7.3.1.2-2: SS-SINR Intra frequency test parameters

Parameter		Unit	Test 1		Test 2		
			Cell 1	Cell 2	Cell 1 Cell 2 freq1		
SSB ARFCN	Config 1		fre		DD Ire	<b>1</b> 1	
Duplex mode	Config 2,3				DD DD		
	Config 1			Not Ap	plicable		
TDD configuration	Config 2			TDDC	onf.1.1		
	Config 3			TDDConf.2.1			
Downlink initial BWP co	onfiguration			DLBV	VP.0.1		
Downlink dedicated BV	VP configuration			DLBV	WP.1.1		
Uplink initial BWP conf	iguration			ULBV	VP.0.1		
Uplink dedicated BWP	configuration			ULBV	VP.1.1		
DRX Cycle configuration	on	ms		Not Ap	plicable		
TRS configuration	Config 1			TRS.1	.1 FDD		
	Config 2			TRS.1	.1 TDD		
	Config 3			TRS.1	.2 TDD		
	Config 1		SR.1.1 FDD		SR.1.1 FDD		
PDSCH Reference measurement channel	Config 2		SR.1.1 TDD	-	SR.1.1 TDD	-	
onanner	Config 3		SR.2.1 TDD		SR2.1 TDD		
	Config 1		CR.1.1 FDD		CR.1.1 FDD		
RMSI CORESET Reference Channel	Config 2		CR.1.1 TDD	-	CR.1.1 TDD		
	Config 3		CR.2.1 TDD		CR.2.1 TDD		
	Config 1		CCR.1. 1 FDD		CCR.1.1 FDD		
Dedicated CORESET Reference Channel	Config 2		CCR.1. 1 TDD	-	CCR.1.1 TDD	-	
	Config 3		CCR.2. 1 TDD		CCR.2.1 TDD		
OCNG Patterns				0	P.1		
SS-RSSI-Measuremen	t			Not Ap	plicable		
SMTC configruation				SM	TC.1		
CCD confirmation	Config 1,2			SSB.	1 FR1		
SSB configuration	Config 3			SSB.	2 FR1		
PDSCH/PDCCH	Config 1,2	1.11	15				
subcarrier spacing	Config 3	kHz		3	30		
EPRE ratio of PSS to SSS							
EPRE ratio of PBCH DMRS to SSS		_					
EPRE ratio of PBCH to PI EPRE ratio of PDCCH DN EPRE ratio of PDCCH to EPRE ratio of PDSCH DN EPRE ratio of PDSCH to	MRS to SSS PDCCH DMRS MRS to SSS	dB	0	0	0	0	

EPRE ratio	of OCNG DM	RS to SSS(Note 1)					
		CNG DMRS (Note 1)	1				
		NR_FDD_FR1_A, NR_TDD_FR1_A				-11	16
		NR_FDD_FR1_B	1			-11:	5.5
		NR_TDD_FR1_C	dDm/15kU			-115	
$N_{oc}^{$		NR_FDD_FR1_D,	dBm/15kH z	-93		-114	4.5
		NR_TDD_FR1_D	_			4.	1.4
		NR_FDD_FR1_E, NR_TDD_FR1_E				-11	14
		NR FDD FR1 G	-			-11	13
		NR FDD FR1 H	1			-112	
	Config 1,2			_0	93	Same as	
	Corning 1,2	T	_			15 k	Hz
		NR_FDD_FR1_A,				4.	10
		NR_TDD_FR1_A				-11	13
		NR FDD FR1 B	1			-11:	2.5
$N_{oc}^{ m Note2}$		NR_TDD_FR1_C	dBm/SCS			-11	
	Config 3	NR_FDD_FR1_D,		-90		-11 <sup>-</sup>	 1.5
		NR_TDD_FR1_D	4				
		NR_FDD_FR1_E, NR_TDD_FR1_E				-111	
		NR FDD FR1 G	1			-110	
		NR_FDD_FR1_H	1			-109.5	
$\hat{E}_s/I_{ot}$				0	-3.19	-5.46	-5.46
$\hat{E}_s/N_{oc}$			dB	4.54	2.66	-4	-4
37 00		NR_FDD_FR1_A,					
		NR_TDD_FR1_A				-120	-120
		NOTE 6					
	Config 1,2	NR_FDD_FR1_B	-			-119.5	-119.5
		NR_TDD_FR1_C NR_FDD_FR1_D,		-88.46	-90.34	-119	-119
		NR TDD FR1 D			-90.54	-118.5	-118.5
		NR FDD FR1 E,	1			440	440
		NR_TDD_FR1_E				-118	-118
SS-		NR_FDD_FR1_G	_			-117	-117
RSRP <sup>Not</sup>		NR_FDD_FR1_H NR_FDD_FR1_A,	dBm/SCS			-116.5	-116.5
e3		NR_TDD_FR1_A,				-117	-117
		NOTE 6					<u> </u>
		NR_FDD_FR1_B	1			-116.5	-116.5
	0	NR_TDD_FR1_C	-	05.40	07.04	-116	-116
	Config 3	NR_FDD_FR1_D, NR_TDD_FR1_D		-85.46	-87.34	-115.5	-115.5
		NR_FDD_FR1_E,	1			-115	-115
		NR_TDD_FR1_E					
		NR_FDD_FR1_G	1			-114	-114
		NR_FDD_FR1_H				-113.5	-113.5
		NR_FDD_FR1_A, NR_TDD_FR1_A					
		NOTE 6					
		NR_FDD_FR1_B	1				
SS-SINR N	ote3	NR_TDD_FR1_C	dB	0	-3.19	-5.46	-5.46
JO-SINK"		NR_FDD_FR1_D,	ub		-5.18	-5.40	-5.40
		NR_TDD_FR1_D	-				
		NR_FDD_FR1_E, NR_TDD_FR1_E					
		NR FDD FR1 G	1				
			•				

NR FDD FR1 H	
NR_FDD_FR1_A, -85.51 NR_TDD_FR1_A NOTE 6	
NR_FDD_FR1_B -85.01	
NR_TDD_FR1_C -84.51	
Config NR_FDD_FR1_D, dBm/ 9.36MHz -57.5 -84.01	
NR_FDD_FR1_E, NR_TDD_FR1_E -83.51	
NR_FDD_FR1_G -82.51	
lo <sup>Note3</sup>	
NR_FDD_FR1_A, -79.41 NR_TDD_FR1_A NOTE 6	
NR_FDD_FR1_B -78.91	
NR_TDD_FR1_C	
Config 3 NR_FDD_FR1_D, NR_TDD_FR1_D 38.16MHz -51.41 -77.91	
NR_FDD_FR1_E, -77.41	
NR_TDD_FR1_E NR_FDD_FR1_G -76.41	
NR FDD FR1 H -75.91	
Propagation condition - AWGN	
Antenna configuration - 1x2	
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total	

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.
- Note 3: SS-SINR, SS-RSRP, and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 5: NR operating band groups are as defined in clause 3.5.2.
- Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification

#### A.6.7.3.1.3 Test Requirements

The SS-SINR measurement accuracy shall fulfil the requirements in clause 10.1.12.1.1.

# A.6.7.3.2 SA Inter-frequency measurement accuracy with FR1 serving cell and FR1 target cell

#### A.6.7.3.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clauses 10.1.14.1.1 and 10.1.14.1.2.

#### A.6.7.3.2.2 Test Parameters

In this test case the two cells (i.e., Cell 1 and Cell 2) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table A.6.7.3.2.2-1. Both absolute accuracy and relative accuracy requirements of SS-SINR inter-frequency measurement are tested by using test parameters in Table A.6.7.3.2.2-2. In all test cases, Cell 1 is the PCell and Cell 2 is target cell.

Table A.6.7.3.2.2-1: SS-SINR Inter frequency SS-SINR supported test configurations

	Config	Description
1		NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2		NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3		NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note:	The UE is only	required to be tested in one of the supported test configurations

Table A.6.7.3.2.2-2: SS-SINR Inter frequency test parameters

Parame	itor	Unit	Test 1		Test 2 Test 3				
		Onit	Cell 1	Cell 2	Cell 1	Cell 2	Cell 1	Cell 2	
SSB ARFCN	0		freq1	freq2	freq1	freq2	freq1	freq2	
Duplex mode	Config 1 Config 2,3		FDD TDD						
	Config 1		Not Applicable						
TDD configuration	Config 2		TDDConf.1.1						
	Config 3		TDDConf.2.1						
Downlink initial BWP cor	figuration				DLBW	/P.0.1			
Downlink dedicated BWF	onfiguration				DLBW	/P.1.1			
Uplink initial BWP config	uration				ULBW	/P.0.1			
Uplink dedicated BWP co	onfiguration				ULBW	/P.1.1			
DRX Cycle configuration		ms			Not App				
TRS configuration	Config 1				TRS.1.				
	Config 2				TRS.1.				
	Config 3				TRS.1.	2 TDD			
	Config 1		SR.1.1 FDD		SR.1.1 FDD		SR.1.1 FDD		
PDSCH Reference measurement channel	Config 2		SR.1.1 TDD	-	SR.1.1 TDD	-	SR.1.1 TDD	_	
	Config 3		SR2.1 TDD		SR2.1 TDD		SR2.1 TDD		
	Config 1		CR.1.1 FDD	-	R.1.1 FDD	-	CR.1.1 FDD		
RMSI CORESET Reference Channel	Config 2		CR.1.1 TDD		CR.1.1 TDD		CR.1.1 TDD		
	Config 3		CR2.1 TDD		CR2.1 TDD		CR2.1 TDD		
	Config 1		CCR.1 .1 FDD		CCR.1. 1 FDD		CCR.1. 1 FDD		
Dedicated CORESET Reference Channel	Config 2		CCR.1 .1 TDD	-	CCR.1. 1 TDD	-	CCR.1. 1 TDD	-	
	Config 3		CCR2. 1 TDD		CCR2.1 TDD		CCR2. 1 TDD		
OCNG Patterns					OF	P.1			
SS-RSSI-Measurement					Not App	olicable			
SMTC configuration					SMT	C.1			
SSB configuration	Config 1,2				SSB.				
COD Configuration	Config 3				SSB.2	2 FR1			
	Config 1,2	kHz			15				

	PDSCH/PDCCH Config 3 subcarrier spacing			30								
	spacing of PSS to SSS											
	of PBCH DMRS	to SSS										
	of PBCH to PBC											
	of PDCCH DMR: of PDCCH to PD		dB	0	0	0	0	0	0			
	of PDSCH DMR		QD.	U	0	U	O	0	O			
EPRE ratio	of PDSCH to PD	SCH										
	of OCNG DMRS											
EFRETALIO	EPRE ratio of OCNG to OCNG DMRS (Note 1)    NR_FDD_FR1_A   NR_TDD_FR1_A   NOTE 6			<u> </u>				-119.5				
	Config 1,2	NR_FDD_FR1_B						-119 -118.5				
$N_{oc}$ Note2		NR_TDD_FR1_C NR_FDD_FR1_D NR_TDD_FR1_D	dBm/15kHz	-8	88	-108.5		-110 -11				
		NR_FDD_FR1_E NR_TDD_FR1_E						-11 <sup>°</sup>	7.5			
		NR_FDD_FR1_G						-116.5				
		NR_FDD_FR1_H						-11	16			
$N_{oc}$	Config 1,2 N			-88		-108.5		Same as Noc for 15kHz T				
Note2		NR_FDD_FR1_A NR_TDD_FR1_A NOTE 6	dBm/15kHz	-85		-105.5		-116.5				
		NR_FDD_FR1_B						-116 -115.5				
	Config 3	NR_TDD_FR1_C NR_FDD_FR1_D						-11:	5.5			
	Conlig 3	NR_TDD_FR1_D NR_FDD_FR1_E						-11				
		NR_TDD_FR1_E						-114				
		NR FDD FR1 G NR FDD FR1 H						-114 -17				
$\hat{E}_s/I_{ot}$		NIK_1	dB	-1.75	-1.75	20	20	-4.0	-4.0			
$\hat{E}_s/N_{oc}$			dB	-1	.75	2	0	-4.	.0			
		NR_FDD_FR1_A NR_TDD_FR1_A NOTE 6						-12				
		NR_FDD_FR1_B NR_TDD_FR1_C						-12 -12				
SS- RSRP	Config 1,2	NR_FDD_FR1_D NR_TDD_FR1_D	dBm/SCS	-89	9.75	-88	3.5	-12				
Note3		NR_FDD_FR1_E NR_TDD_FR1_E	= 5.5					-12	1.5			
		NR_FDD_FR1_G NR_FDD_FR1_H						-120.5 -120				
	Config 3	NR_FDD_FR1_A		-86	6.75	-85.5		-120 -120.5				

		NR TDD FR1 A				
		NR_IDD_FRI_A NOTE 6				
		NR FDD FR1 B				-120
		NR TDD FR1 C	1			-119.5
		NR FDD FR1 D	1			110
		NR_TDD_FR1_D				-119
		NR_FDD_FR1_E				-118.5
		NR_TDD_FR1_E				
		NR_FDD_FR1_G				-117.5
		NR_FDD_FR1_H				-117
		NR_FDD_FR1_A				
		NR_TDD_FR1_A				
		NR FDD FR1 B				
		NR TDD FR1 C				
SS-SINR <sup>N</sup>	ote3	NR FDD FR1 D	dB	-1.75	20	-4.0
		NR_TDD_FR1_D	-	0	20	
		NR FDD FR1 E				
		NR_TDD_FR1_E				
		NR_FDD_FR1_G				
		NR_FDD_FR1_H				
		NR_FDD_FR1_A		-57.83	-60.5	
		NR_TDD_FR1_A				-90.09
		NR FDD FR1 B				-89.59
		NR TDD FR1 C				-89.09
	Config 1,2	NR FDD FR1 D	dBm/			
	Comig 1,2	NR TDD FR1 D	9.36MHz	07.00		-88.59
		NR FDD FR1 E				20.00
		NR_TDD_FR1_E				-88.09
		NR_FDD_FR1_G				-87.09
Io <sup>Note3</sup>		NR_FDD_FR1_H				-86.59
10		NR_FDD_FR1_A				
		NR_TDD_FR1_A				-84
						92.5
		NR FDD FR1 B	1			-83.5 -83
	Config 3	NR FDD FR1 D	dBm/	-51.73	-54.41	
	Coming 3	NR_TDD_FR1_D	38.16MHz	-31.73	<del>-</del> J <del>4</del> .41	-82.5
		NR_FDD_FR1_E				
		NR TDD FR1 E				-82
		NR FDD FR1 G	1			-81
		NR_FDD_FR1_H	1			-80.5
	on condition		-		AWGN	•
Antenna c	onfiguration		-		1x2	

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

Note 3: SS-SINR, SS-RSRP, and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: NR operating band groups are as defined in clause 3.5.2.

Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification

#### A.6.7.3.2.3 Test Requirements

The SS-SINR measurement accuracy shall fulfil the requirements in clause 10.1.14.1.1 and 10.1.14.1.2.

### A.6.7.4 L1-RSRP measurement for beam reporting

#### A.6.7.4.1 SSB based L1-RSRP measurement

#### A.6.7.4.1.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clause 9.5.2 and clause 10.1.19.1 for L1-RSRP measurements based on SSB with the testing configurations for NR cells in Table A.6.7.4.1.1-1.

Table A.6.7.4.1.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test

	Config	Description
1		NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2		NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3		NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note:	The UE is only re	equired to be tested in one of the supported test configurations in each supported band

#### A.6.7.4.1.2 Test parameters

In this set of test cases there one cell in the test, PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.6.7.4.1.2-1 below. The absolute and relative accuracy of L1-RSRP measurements are tested by using the parameters in Table A.6.7.4.1.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured one SSB resource set with two SSB resources. UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSB resources 0 and 1.

Table A.6.7.4.1.2-1: FR1 SSB based L1-RSRP test parameters

	Parameter	Config	Unit	Test 1	Test 2
SSB GS	CN	1~3		freq1	freq1
		1		FDD	FDD
Duplex n	Duplex mode		1	TDD	TDD
				TDD	TDD
		1		N/A	N/A
TDD Configuration		2	1	TDDConf.1.1	TDDConf.1.1
	- 3			TDDConf.2.1	TDDConf.2.1
		1		10: N <sub>RB,c</sub> = 52	10: N <sub>RB,c</sub> = 52
BW <sub>channel</sub>	BW <sub>channel</sub>		MHz	10: N <sub>RB,c</sub> = 52	10: N <sub>RB,c</sub> = 52
		3		40: N <sub>RB,c</sub> = 106	40: N <sub>RB,c</sub> = 106
DDSCH	Deference	1		SR.1.1 FDD	SR.1.1 FDD
	Reference	2	1	SR.1.1 TDD	SR.1.1 TDD
measure	ment channel	3		SR.2.1 TDD	SR.2.1 TDD
DMOI 00	ODEOET D. (	1		CR.1.1 FDD	CR.1.1 FDD
	ORESET Reference	2	1	CR.1.1 TDD	CR.1.1 TDD
Channel		3		CR.2.1 TDD	CR.2.1 TDD
5 : .	LOODEGET	1		CCR.1.1 FDD	CCR.1.1 FDD
	ed CORESET	2	1	CCR.1.1 TDD	CCR.1.1 TDD
Reference	ce Channel	3		CCR.2.1 TDD	CCR.2.1 TDD
		1		SSB.3 FR1	SSB.3 FR1
SSB con	figuration	2		SSB.3 FR1	SSB.3 FR1
000 0011	garation	3		SSB.4 FR1	SSB.4 FR1
OCNG P	atterns	1~3		OP.1	OP.1
		1~3		DLBWP.0.1	DLBWP.0.1
Initial BV	Initial BWP Configuration			ULBWP.0.1	ULBWP.0.1
		1		TRS.1.1 FDD	TRS.1.1 FDD
TRS con	figuration	2		TRS.1.1 TDD	TRS.1.1 TDD
1110 0011	inguruaiori	3		TRS.1.2 TDD	TRS.1.2 TDD
Dedicate	ed BWP configuration	1~3		DLBWP.1.1	DLBWP.1.1
SMTC or	onfiguration	1~3		ULBWP.1.1 SMTC.1	ULBWP.1.1 SMTC.1
		1~3		periodic	periodic
reportCo		1~3			·
reportQu				ssb-Index-RSRP	ssb-Index-RSRP
	of reported RS	1~3		2	2
	P reporting period of PSS to SSS	1~3		slot80	slot80
	o of PBCH DMRS to SSS				
	o of PBCH to PBCH DMRS				
	o of PDCCH DMRS to SSS				
	o of PDCCH to PDCCH				
DMRS	(5556) 51456 ( 666	4.0	-ID		
	o of PDSCH DMRS to SSS o of PDSCH to PDSCH	1~3	dB	0	0
DMRS	0 01 PDSCH 10 PDSCH				
	EPRE ratio of OCNG DMRS to				
EPRE ratio	o of OCNG to OCNG				
DMRS Note	1				
	NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5				-117
$N_{oc}$	NR FDD FR1 B				-116.5
Note2	NR TDD FR1 C	1~3	dBm/15kHz	-94.65	-116
	NR_FDD_FR1_D,	. •		2 2.00	-115.5
	NR_TDD_FR1_D NR_FDD_FR1_E,				115
	NR_TDD_FR1_E				-115

	T	ı	_	1	
	NR_FDD_FR1_G				-114
	NR_FDD_FR1_H				-113.5
	NR_FDD_FR1_A, NR_TDD_FR1_A				-117
	NOTE 5				
	NR_FDD_FR1_B				-116.5
	NR_TDD_FR1_C	1,2			-116
	NR_FDD_FR1_D,			-94.65	-115.5
	NR_TDD_FR1_D				
	NR_FDD_FR1_E, NR_TDD_FR1_E				-115
	NR FDD FR1 G				-114
$N_{oc}$	NR FDD FR1 H		dBm/SSB		-113.5
Note2	NR FDD FR1 A,		SCS		
	NR_TDD_FR1_A				-114
	NR FDD FR1 B				-113.5
	NR TDD FR1 C				-113.5
	NR FDD FR1 D,	3		-91.65	
	NR_TDD_FR1_D				-112.5
	NR_FDD_FR1_E,				-112
	NR_TDD_FR1_E	-			
	NR_FDD_FR1_G				-111
^ /	NR_FDD_FR1_H				-110.5
$\hat{\mathrm{E}}_{_{\mathrm{s}}}/\mathrm{I}_{_{\mathrm{ot}}}$		1~3	dB	10	-3
	NR_FDD_FR1_A,	1,2			
	NR_TDD_FR1_A				-120
					110 5
	NR_FDD_FR1_B NR_TDD_FR1_C			-84.65	-119.5 -119
	NR FDD FR1 D,				
	NR_TDD_FR1_D	.,_			-118.5
	NR_FDD_FR1_E,				-118
	NR_TDD_FR1_E		dBm/SSB SCS		
SSB	NR_FDD_FR1_G				-117
RSRP	NR_FDD_FR1_H				-116.5
Note3	NR_FDD_FR1_A, NR_TDD_FR1_A				-117
	NOTE 5				'''
	NR_FDD_FR1_B				-116.5
	NR_TDD_FR1_C				-116
	NR_FDD_FR1_D,	3		-81.65	-115.5
	NR_TDD_FR1_D NR_FDD_FR1_E,				
	NR_FDD_FR1_E,				-115
	NR FDD FR1 G				-114
	NR_FDD_FR1_H				-113.5
	NR_FDD_FR1_A,				
	NR_TDD_FR1_A				-87.28
	NR FDD FR1 B				-86.78
	NR TDD FR1 C				-86.28
lo Note3	NR FDD FR1 D,	1,2	dBm/9.36	-56.28	
'-	NR_TDD_FR1_D	.,_	MHz	33.23	-85.78
	NR_FDD_FR1_E,				-85.28
	NR_TDD_FR1_E				
	NR_FDD_FR1_G				-84.28
	NR FDD FR1 H			1	-83.78

NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5				-81.19
NR_FDD_FR1_B				-80.69
NR_TDD_FR1_C		dDm/20.16		-80.19
NR_FDD_FR1_D, NR_TDD_FR1_D	3	dBm/38.16 MHz	-50.19	-79.69
NR_FDD_FR1_E, NR_TDD_FR1_E				-79.19
NR_FDD_FR1_G				-78.19
NR_FDD_FR1_H				-77.69
$\hat{E}_s/N_{oc}$	1~3	dB	10	-3
Propagation condition	1~3		AWGN	AWGN
Antenna configuration	1~3		1x2	1x2
Note 1: OCNG shall be used s transmitted power spe				ant total
Note 2: Interference from other calls and poice accuracy not appointed in				a assumed to be

- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.
- Note 3: RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

#### A.6.7.4.1.3 Test Requirements

The L1-RSRP measurement accuracy for SSB#0 and SSB#1 of Cell 2 shall fulfil the requirements in clauses 10.1.19.1.

#### A.6.7.4.2 CSI-RS based L1-RSRP measurement on resource set with repetition off

#### A.6.7.4.2.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clause 9.5.3 and clause 10.1.19.2 for L1-RSRP measurements based on CSI-RS with the testing configurations for NR cells in Table A.6.7.4.2.1-1.

Table A.6.7.4.2.1-1: Applicable NR configurations for FR1 CSI-RS based L1-RSRP test

	Description	
1		NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode
2		NR 15 kHz CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode
3		NR 30kHz CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode
Note:	The UE is only re	equired to be tested in one of the supported test configurations in each supported band

#### A.6.7.4.2.2 Test parameters

In this set of test cases there are one cell in the test, PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.6.7.4.2.2-1 below. The absolute and relative accuracy of L1-RSRP measurements are tested by using the parameters in Table A.6.7.4.2.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured one CSI-RS resource set with two CSI-RS resources. UE is configured to perform RLM and BFD based on SSB 0 and 1. CSI-RS is not transmitted in the same OFDM symbols as SSB.

Table A.6.7.4.2.2-1: FR1 CSI-RS based L1-RSRP test parameters

SSB GSCN	Parameter	Config	Unit	Test 1	Test 2
Duplex mode	SSB GSCN	1~3		freq1	freq1
TDD					FDD
TDD Configuration	Duplex mode	2	1	TDD	TDD
TDDConfi.1   TDDConfi.1   TDDConfi.1   TDDConfi.1   TDDConfi.1   TDDConfi.1   TDDConfi.1   TDDConfi.1   TDDConfi.2   TDDConfi.1   TDDConfi.2   TDDConfi.2   TDDConfi.2   TDDConfi.2   TDDConfi.1   TDDConfi.2   TDD		3	1	TDD	TDD
BWchannel		1		N/A	N/A
BW_channel	TDD Configuration	2		TDDConf.1.1	TDDConf.1.1
BW_channel		3		TDDConf.2.1	TDDConf.2.1
PDSCH Reference		1		10: N <sub>RB,c</sub> = 52	10: N <sub>RB,c</sub> = 52
PDSCH Reference measurement channel	BWchannel	2	MHz	10: N <sub>RB,c</sub> = 52	10: N <sub>RB,c</sub> = 52
PUSCH Reference measurement channel   3		3		·	· ·
Measurement channel   2   SR.1.1 IDD   SR.2.1 TDD   CR.1.1 FDD   CR.1.1 FDD   CR.1.1 FDD   CR.1.1 FDD   CR.1.1 TDD   CR.2.1 TDD   CCR.2.1 TDD   SSB.1 FR1   SSB.1 FR1   SSB.1 FR1   SSB.2 FR2 FR2 FR2 FR2 FR2 FR2 FR2 FR2 FR2 FR	PDSCH Reference				
RMSI CORESET Reference				SR.1.1 TDD	
CR.1.1 TDD   CR.1.1 TDD	measurement channel			SR.2.1 TDD	
CR.1.1 TDD	PMSI CORESET Pafarance			CR.1.1 FDD	CR.1.1 FDD
Dedicated CORESET   1		2			
Dedicated CORESET   Reference Channel   3	Onamici	3		CR.2.1 TDD	
Reference Channel   2	Dedicated CORESET	1		CCR.1.1 FDD	CCR.1.1 FDD
SSB configuration				CCR.1.1 TDD	
SSB configuration   2   3   3   SSB.1 FR1   SSB.1 FR1   SSB.2 FR	Treference Chainnei	3		CCR.2.1 TDD	CCR.2.1 TDD
SSB.2 FR1   SSB.2 FR1   OCNG Patterns   1~3   OP.1   OP.1				SSB.1 FR1	SSB.1 FR1
OCNG Patterns	SSB configuration	2		SSB.1 FR1	SSB.1 FR1
TRS configuration		3		SSB.2 FR1	SSB.2 FR1
TRS configuration	OCNG Patterns	1~3		OP.1	OP.1
TRS.1.2 TDD				TRS.1.1 FDD	TRS.1.1 FDD
Initial BWP Configuration	TRS configuration	2		TRS.1.1 TDD	TRS.1.1 TDD
Initial BWP Configuration		3		TRS.1.2 TDD	TRS.1.2 TDD
Dedicated BWP configuration	Initial BWP Configuration	1~3			
SMTC configuration	Dedicated BWP configuration	1~3			
1	SMTC configuration	1~3			
CSI-RS	- 3				
SI-RS 2.2 TDD	CSI-RS	2	1		
TeportConfigType					
TeportQuantity	reportConfigType				
Number of reported RS					
L1-RSRP reporting period		1~3			
EPRE ratio of PSS to SSS           EPRE ratio of PBCH DMRS to SSS           EPRE ratio of PDCCH DMRS to SSS           EPRE ratio of PDCCH to PDCCH DMRS           DMRS           EPRE ratio of PDSCH DMRS to SSS           EPRE ratio of PDSCH to PDSCH DMRS to SSS           EPRE ratio of PDSCH to PDSCH DMRS to SSSNote 1           EPRE ratio of OCNG DMRS to SSSNote 1           EPRE ratio of OCNG to OCNG DMRS Note 1           EPRE ratio of OCNG to OCNG DMRS Note 1           EPRE ratio of DMRS Note 1           Noc Note 2           NR_FDD_FR1_A, NOTE 5           NR_FDD_FR1_B           1~3           dBm/15kHz           -94.65           -116.5		1~3		slot80	slot80
EPRE ratio of PBCH to PBCH DMRS           EPRE ratio of PDCCH DMRS to SSS           EPRE ratio of PDCCH to PDCCH           DMRS           EPRE ratio of PDSCH DMRS to SSS           EPRE ratio of PDSCH to PDSCH           DMRS           EPRE ratio of OCNG DMRS to SSSNote 1           EPRE ratio of OCNG to OCNG DMRS to SSSNote 1           EPRE ratio of OCNG to OCNG DMRS Note 1           Nore 1           NR_FDD_FR1_A, NR_TDD_FR1_A, NOTE 5           NR_FDD_FR1_B           1~3           dBm/15kHz           -94.65           -116.5	EPRE ratio of PSS to SSS				
EPRE ratio of PDCCH DMRS to SSS           EPRE ratio of PDCCH to PDCCH           DMRS           EPRE ratio of PDSCH DMRS to SSS           EPRE ratio of PDSCH to PDSCH           DMRS           EPRE ratio of OCNG DMRS to SSSNote 1           EPRE ratio of OCNG to OCNG DMRS to SSSNote 1           EPRE ratio of OCNG to OCNG DMRS Note 1           Nore Note 1           Note 2           NR_FDD_FR1_A NOTE 5           NR_FDD_FR1_B           1~3           dBm/15kHz           -94.65           -116.5					
EPRE ratio of PDCCH to PDCCH DMRS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH to PDSCH DMRS  EPRE ratio of OCNG DMRS to SSSNote 1  EPRE ratio of OCNG to OCNG DMRS Note 1  NR_FDD_FR1_A, NOTE 5 NR_FDD_FR1_B  1~3  dB 0 0 0 1 1 - 3  dB 1 0 1 - 3  dB 1 0 0 1 - 117					
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$					
EPRE ratio of PDSCH DMRS to SSS         1~3         dB         0         0           EPRE ratio of PDSCH to PDSCH DMRS         0         0         0           EPRE ratio of OCNG DMRS to SSSNote 1         0         0         0           EPRE ratio of OCNG DMRS to SSSNote 1         0         0         0           EPRE ratio of OCNG to OCNG DMRS to SSSNote 1         0         0         0           EPRE ratio of OCNG to OCNG DMRS to SSSNote 1         0         0         0           EPRE ratio of OCNG to OCNG DMRS to SSSNote 1         0         0         0           EPRE ratio of OCNG to OCNG DMRS to SSSNote 1         0         0         0         0           EPRE ratio of OCNG DMRS to SSSNote 1         0					
DMRS		1~3	dB	0	0
EPRE ratio of OCNG DMRS to   SSSNote 1     EPRE ratio of OCNG to OCNG   DMRS Note 1					
SSSNote 1					
EPRE ratio of OCNG to OCNG					
Note2       NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5       1~3       dBm/15kHz       -94.65         NR_FDD_FR1_B       -116.5	EPRE ratio of OCNG to OCNG				
Note2         NR_TDD_FR1_A NOTE 5         1~3         dBm/15kHz         -94.65           NR_FDD_FR1_B         -116.5					
NR_FDD_FR1_B -116.5	$N_{oc}$ NR_TDD_FR1_A	1~3	dBm/15kHz	<b>-</b> 94.65	-117
		. •			-116.5

	NR_FDD_FR1_D,				-115.5
	NR_TDD_FR1_D NR_FDD_FR1_E,				
	NR TDD FR1 E				-115
	NR FDD FR1 G				-114
	NR FDD FR1 H				-113.5
	NR FDD FR1 A,				
	NR TDD FR1 A				-117
	NOTE 5				
	NR_FDD_FR1_B				-116.5
	NR_TDD_FR1_C				-116
	NR_FDD_FR1_D,	1,2		-94.65	-115.5
	NR_TDD_FR1_D NR_FDD_FR1_E,				
	NR TDD FR1 E				-115
	NR FDD FR1 G				-114
$N_{oc}$	NR FDD FR1 H		dBm/CSI-RS		-113.5
Note2	NR_FDD_FR1_A,		SCS		
	NR_TDD_FR1_A				-114
	NOTE 5				
	NR_FDD_FR1_B				-113.5
	NR_TDD_FR1_C	2		04.65	-114
	NR_FDD_FR1_D, NR_TDD_FR1_D	3		-91.65	-112.5
	NR FDD FR1 E,				
	NR TDD FR1 E				-112
	NR_FDD_FR1_G				-111
	NR_FDD_FR1_H				-110.5
$\hat{E}_s/I_{ot}$		1~3	dB	10	-3
	NR FDD FR1 A,				
	NR_TDD_FR1_A			-84.65	-120
	NOTE 5				
	NR_FDD_FR1_B				-119.5
	NR_TDD_FR1_C				-119
	NR_FDD_FR1_D, NR_TDD_FR1_D	1,2			-118.5
	NR FDD FR1 E,				
	NR TDD FR1 E				440
	NR FDD FR1 G				-118
CSI-RS					
RSRP	NR FDD FR1 H		dBm/CSI-RS		-118 -117 -116.5
	NR_FDD_FR1_A,		dBm/CSI-RS SCS		-117
RSRP Note3	NR_FDD_FR1_A, NR_TDD_FR1_A				-117
	NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5				-117 -116.5 -117
	NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5 NR_FDD_FR1_B				-117 -116.5 -117 -116.5
	NR_FDD_FR1_A, NR_TDD_FR1_A NOTE5  NR_FDD_FR1_B NR_TDD_FR1_C	2		91.65	-117 -116.5 -117
	NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5  NR_FDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D,	3		-81.65	-117 -116.5 -117 -116.5
	NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5  NR_FDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D, NR_TDD_FR1_D	3		-81.65	-117 -116.5 -117 -116.5 -116 -115.5
	NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5  NR_FDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D,	3		-81.65	-117 -116.5 -117 -116.5 -116
	NR_FDD_FR1_A, NR_TDD_FR1_A NOTE5  NR_FDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D, NR_TDD_FR1_D NR_FDD_FR1_E, NR_TDD_FR1_E NR_FDD_FR1_G	3		-81.65	-117 -116.5 -117 -116.5 -116 -115.5 -115
	NR_FDD_FR1_A, NR_TDD_FR1_A NOTE5  NR_FDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D, NR_TDD_FR1_D NR_FDD_FR1_E, NR_TDD_FR1_E NR_FDD_FR1_G NR_FDD_FR1_G NR_FDD_FR1_H	3		-81.65	-117 -116.5 -117 -116.5 -116 -115.5 -115
	NR_FDD_FR1_A, NR_TDD_FR1_A NOTE5  NR_FDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D, NR_TDD_FR1_D NR_FDD_FR1_E, NR_TDD_FR1_E NR_FDD_FR1_G NR_FDD_FR1_G NR_FDD_FR1_H NR_FDD_FR1_A,	3		-81.65	-117 -116.5 -117 -116.5 -116 -115.5 -115 -114 -113.5
	NR_FDD_FR1_A, NR_TDD_FR1_A NOTE5  NR_FDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D, NR_TDD_FR1_D NR_FDD_FR1_E, NR_TDD_FR1_E NR_FDD_FR1_G NR_FDD_FR1_G NR_FDD_FR1_H NR_FDD_FR1_A, NR_TDD_FR1_A	3		-81.65	-117 -116.5 -117 -116.5 -116 -115.5 -115
	NR_FDD_FR1_A, NR_TDD_FR1_A NOTE5  NR_FDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D, NR_TDD_FR1_E, NR_TDD_FR1_E NR_FDD_FR1_G NR_FDD_FR1_G NR_FDD_FR1_H NR_FDD_FR1_A, NR_TDD_FR1_A NOTE5	3		-81.65	-117 -116.5 -117 -116.5 -116 -115.5 -115 -114 -113.5 -87.28
Note3	NR_FDD_FR1_A, NR_TDD_FR1_A NOTE5  NR_FDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D, NR_TDD_FR1_E, NR_TDD_FR1_E NR_FDD_FR1_G NR_FDD_FR1_H NR_FDD_FR1_A, NR_TDD_FR1_A, NR_TDD_FR1_A NOTE5  NR_FDD_FR1_B		SCS dBm/9.36		-117 -116.5 -117 -116.5 -116 -115.5 -115 -114 -113.5 -87.28 -86.78
	NR_FDD_FR1_A, NR_TDD_FR1_A NOTE5  NR_FDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D, NR_TDD_FR1_E, NR_TDD_FR1_E NR_FDD_FR1_G NR_FDD_FR1_H NR_FDD_FR1_A, NR_TDD_FR1_A, NR_TDD_FR1_A NOTE5  NR_FDD_FR1_B NR_TDD_FR1_B NR_TDD_FR1_C	1,2	SCS	-81.65 -56.28	-117 -116.5 -117 -116.5 -116 -115.5 -115 -114 -113.5 -87.28 -86.78 -86.28
Note3	NR_FDD_FR1_A, NR_TDD_FR1_A NOTE5  NR_FDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D, NR_TDD_FR1_E, NR_TDD_FR1_E NR_FDD_FR1_G NR_FDD_FR1_H NR_FDD_FR1_A, NR_TDD_FR1_A, NR_TDD_FR1_A NOTE5  NR_FDD_FR1_B NR_TDD_FR1_B NR_TDD_FR1_D,		SCS dBm/9.36		-117 -116.5 -117 -116.5 -116 -115.5 -115 -114 -113.5 -87.28 -86.78
Note3	NR_FDD_FR1_A, NR_TDD_FR1_A NOTE5  NR_FDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D, NR_TDD_FR1_E, NR_TDD_FR1_E NR_FDD_FR1_B NR_FDD_FR1_A, NR_TDD_FR1_A, NR_TDD_FR1_A NOTE5  NR_FDD_FR1_B NR_TDD_FR1_B NR_TDD_FR1_B NR_TDD_FR1_B NR_TDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D, NR_TDD_FR1_D, NR_TDD_FR1_D NR_FDD_FR1_E,		SCS dBm/9.36		-117 -116.5 -117 -116.5 -116.5 -116 -115.5 -115 -114 -113.5 -87.28 -86.78 -86.28 -85.78
Note3	NR_FDD_FR1_A, NR_TDD_FR1_A NOTE5  NR_FDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D, NR_TDD_FR1_E, NR_TDD_FR1_E NR_FDD_FR1_G NR_FDD_FR1_H NR_FDD_FR1_A, NR_TDD_FR1_A, NR_TDD_FR1_A NOTE5  NR_FDD_FR1_B NR_TDD_FR1_C NR_FDD_FR1_D, NR_TDD_FR1_D, NR_TDD_FR1_D, NR_TDD_FR1_D		SCS dBm/9.36		-117 -116.5 -117 -116.5 -116 -115.5 -115 -114 -113.5 -87.28 -86.78 -86.28

NR_FDD_FR1_G				-84.28
NR_FDD_FR1_H				-83.78
NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5				-81.19
NR_FDD_FR1_B				-80.69
NR_TDD_FR1_C	3	dBm/38.16 MHz		-80.19
NR_FDD_FR1_D, NR_TDD_FR1_D			-50.19	-79.69
NR_FDD_FR1_E, NR_TDD_FR1_E				-79.19
NR_FDD_FR1_G				-78.19
NR_FDD_FR1_H				-77.69
$\hat{E}_s/N_{oc}$	1~3	dB	10	-3
Propagation condition	1~3		AWGN	AWGN
Antenna configuration	1~3		1x2	1x2

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.
- Note 3: RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

#### A.6.7.4.2.3 Test Requirements

The L1-RSRP measurement accuracy for CSI-RS#0 and CSI-RS#1 of Cell 1 shall fulfil the requirements in clause 10.1.19.2.

#### A.6.7.5 E-UTRAN RSRP

#### A.6.7.5.1 SA: inter-RAT measurement accuracy with FR1 serving cell

#### A.6.7.5.1.1 Test Purpose and Environment

The purpose of this test is to verify that the E-UTRAN RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.2.2 for SA inter-RAT E-UTRAN RSRP measurements.

#### A.6.7.5.1.2 Test parameters

In each test there are two cells: Cell 1 and Cell 2. Cell 1 is the NR PCell and Cell 2 is an E-UTRAN inter-RAT neighbour cell. Supported test configurations are shown in table A.6.7.5.1.2-1. The measurement accuracy of SA inter-RAT E-UTRAN RSRP are tested by using the parameters in A.6.7.5.1.2-2 and A.6.7.5.1.2-3.

Table A.6.7.5.1.2-1: Inter-RAT E-UTRAN RSRP supported test configurations with FR1 serving cell

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

Table A.6.7.5.1.2-2: NR Cell specific test parameters for SA Inter-RAT E-UTRAN RSRP test parameters

Parameter		Unit	Cell 1
NR RF channel number			1
Duplex mode	Config 1, 4		FDD
Duplex mode	Config 2, 3, 5, 6		TDD
	Config 1, 4		N/A
TDD Configuration	Config 2, 5		TDDConf.1.1
	Config 3, 6		TDDConf.1.2
	Config 1, 4		10: N <sub>RB,c</sub> = 52 (FDD)
BW <sub>channel</sub>	Config 2, 5	MHz	10: N <sub>RB,c</sub> = 52 (TDD)
	Config 3, 6		40: N <sub>RB,c</sub> = 106 (TDD)
Gap pattern Id			0
DDCCII f	Config 1, 4		SR.1.1 FDD
PDSCH reference measurement channel	Config 2, 5		SR.1.1 TDD
cnannei	Config 3, 6		SR.2.1 TDD
	Config 1, 4		CR.1.1 FDD
CORSET reference channel	Config 2, 5		CR.1.1 TDD
	Config 3, 6	1	CR.2.1 TDD
	Initial DL BWP		DLBWP.0.1
D.M.D. 6	Dedicated DL BWP		DLBWP.1.1
BWP configurations	Initial UL BWP		ULBWP.0.1
	Dedicated UL BWP		ULBWP.1.1
OCNG pattern <sup>Note1</sup>			OP.1
SMTC configuration			SMTC.1
	Config 1, 2, 4, 5		SSB.1 FR1
SSB configuration	Config 3, 6		SSB.2 FR1
EPRE ratio of PSS to SSS	<b>J</b> - <b>J</b> - , -		
EPRE ratio of PBCH DMRS to SS	3		
EPRE ratio of PBCH to PBCH_DM			
EPRE ratio of PDCCH DMRS to S			0
EPRE ratio of PDCCH to PDCCH		dB	
EPRE ratio of PDSCH DMRS to S		†	
EPRE ratio of PDSCH to PDSCH I			
EPRE ratio of OCNG DMRS to SS			
EPRE ratio of OCNG to OCNG DM			
N <sub>oc</sub> Note2		dBm/15 kHz	-104
	Config 1, 2, 4, 5		-104
N <sub>oc</sub> <sup>Note2</sup>	Config 3, 6	dBm/SCS	-101
Ês/Noc	comig o, o	dB	17
Ê <sub>s</sub> /l <sub>ot</sub> Note3		dB	17
	Config 1, 2, 4, 5		-87
SS-RSRP <sup>Note3</sup>	Config 3, 6	dBm/SCS	-84
	Config 1, 2, 4, 5		-87
SSB_RP <sup>Note3</sup>	Config 3, 6	dBm/SCS	-84
	Config 1, 2, 4, 5	dBm/9.36 MHz	-58.96
lo <sup>Note3</sup>	Config 3, 6	dBm/38.16 MHz	-52.87
Propagation condition	Coming 3, 0	GDITI/OU. TO IVITIZ	AWGN
	tion Matrix		
Antenna Configuration and Correla		Illy allocated and a sec	1x2

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

Note 3: Ê<sub>s</sub>/I<sub>ot</sub>, SS-RSRP, SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table A.6.7.5.1.2-3: E-UTRAN Cell specific test parameters for SA Inter-RAT E-UTRAN RSRP test parameters

Parameter		Unit	Cell 2		
			Test 1	Test 2	
E-UTRA RF channel numb					
Duplex mode	Config 1, 2, 3			DD	
	Config 4, 5, 6		TE		
TDD special subframe	Config 1, 2, 3		N/A		
configuration <sup>Note1</sup>	Config 4, 5, 6		(		
TDD uplink-downlink	Config 1, 2, 3		N <sub>i</sub>	/A	
configuration <sup>Note1</sup>	Config 4, 5, 6			<u> </u>	
BW <sub>channel</sub>		MHz	5 MHz: N		
			10 MHz: I 20 MHz: N		
PDSCH parameters:			20 ΙVΙΠΖ. IV	NRB,c - 100	
DL Reference Measureme	nt Channel <sup>Note2</sup>				
PCFICH/PDCCH/PHICH	Config 1, 2, 3		5 MHz: F	2 11 FDD	
parameters:	351mg 1, 2, 6			R.6 FDD	
DL Reference				R.10 FDD	
Measurement	Config 4, 5, 6		5 MHz: F		
Channel <sup>Note2</sup>			10 MHz:	R.6 TDD	
			20 MHz: I	R.10 TDD	
OCNG Patterns <sup>Note2</sup>	Config 1, 2, 3		5 MHz: O		
				OP.6 FDD	
			20 MHz: C		
	Config 4, 5, 6		5 MHz: O		
			10 MHz: OP.2 TDD		
DDOLL DA	7700		20 MHz: OP.8 TDD		
PBCH_RA					
PBCH_RB PSS_RA					
SSS RA					
PCFICH RB					
PHICH RA					
PHICH RB		dB	0		
PDCCH RA		u.b			
PDCCH RB					
PDSCH RA					
PDSCH RB					
OCNG RA <sup>Note3</sup>					
OCNG RB <sup>Note3</sup>					
_	Bands FDD_A Note 9, TDD_A			-117	
	Bands FDD_B1, FDD_B2 Note 10			-116.5	
N <sub>oc</sub> Note4	Bands FDD_C, TDD_C	alDina/4.Eld I=	04.05	-116	
Nochtota	Bands FDD_D	dBm/15kHz	-91.65	-115.5	
	Bands FDD_E, FDD_F Note 7, TDD E			-115	
	Bands FDD_G Note 8			-114	
	Bands FDD_H			-113.5	
Ê <sub>s</sub> /N <sub>oc</sub>		dB	10	-4	
Ê <sub>s</sub> /I <sub>ot</sub> Note5		dB	10	-4	
	Bands FDD_A Note 9, TDD_A			-121	
RSRP <sup>Note5</sup>	Bands FDD_B1, FDD_B2 Note 10	dBm/15kHz	-81.65	-120.5	
	Bands FDD_C, TDD_C			-120	
	Bands FDD_D			-119.5	

	Bands FDD_E, FDD_F Note 7, TDD E			-119
				-118
	Bands FDD H			-117.5
	Bands FDD_A Note 9, TDD_A			-121
	Bands FDD_B1, FDD_B2 Note 10			-120.5
SCH_RPNote5  SCH_RPNote5  SCH_RPNote5  Bands FDD_C, TDD_C Bands FDD_E, FDD_F Note 7, TDD_E Bands FDD_G Note 8 Bands FDD_A Note 9, TDD_A Bands FDD_B1, FDD_B2 Note 10  Bands FDD_C, TDD_C  Bands FDD_C, TDD_C  Bands FDD_D Bands FDD_E, FDD_F	alDina /4 Elst III	04.05	-120	
SCH_RPAGES	Bands FDD_G Note 8	-119.5		
SCH_RP*****	Note 7, TDD_E			-119
	Bands FDD_G Note 8			-118
				-117.5
				-87.76 +
				10log(N <sub>RB,c</sub> /50)
	Bands FDD_B1, FDD_B2 Note 10			-87.26 + 10log(N <sub>RB,c</sub> /50)
	Bands FDD_C, TDD_C			-86.76 + 10log(N <sub>RB,c</sub> /50)
Io <sup>Note5</sup>	Bands FDD_D	dBm/Ch BW		-86.26 + 10log(N <sub>RB,c</sub> /50)
	Bands FDD E, FDD F		3313(1113,3133)	-85.76 +
	Note 7, TDD_E			10log(N <sub>RB,c</sub> /50)
	Bands FDD_G Note 8			-84.76 +
	Bands FDD_H			-04.20 + 10log(N <sub>RB,c</sub> /50)
Propagation Condition	1		AW	
Antenna Configuration and	Correlation Matrix			
Al to the Configuration and				

- Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].
- Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.
- Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.
- Note 5: Ê<sub>s</sub>/I<sub>ot</sub>, RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 6: E-UTRA operating band groups are as defined in clause 3.5 of TS 36.133 [15].
- Note 7: For Band 26, the tests shall be performed with the carrier frequency of assigned E-UTRA channel bandwidth within 865-894 MHz.
- Note 8: Except Band 29.
- Note 9: Except Band 32, Band 75 and Band 76.
- Note 10: For Band 74, the tests shall be performed with the carrier frequency of the assigned E-UTRA channel bandwidth within 1475.9-1510.9 MHz.

#### A.6.7.5.1.3 Test Requirements

The SA inter-RAT E-UTRAN RSRP measurement accuracy for cell 2 shall fulfil absolute requirement in clause 10.2.2.

#### A.6.7.6 E-UTRAN RSRQ

#### A.6.7.6.1 SA: inter-RAT measurement accuracy with FR1 serving cell

#### A.6.7.6.1.1 Test Purpose and Environment

The purpose of this test is to verify that the E-UTRAN RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.2.3 for SA inter-RAT E-UTRAN RSRQ measurements.

#### A.6.7.6.1.2 Test parameters

In each test there are two cells: Cell 1 and Cell 2. Cell 1 is the NR PCell and Cell 2 is an E-UTRAN inter-RAT neighbour cell. Supported test configurations are shown in table A.6.7.6.1.2-1. The measurement accuracy of SA inter-RAT E-UTRAN RSRQ are tested by using the parameters in A.6.7.6.1.2-2 and A.6.7.6.1.2-3.

Table A.6.7.6.1.2-1: Inter-RAT E-UTRAN RSRQ supported test configurations with FR1 serving cell

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

Table A.6.7.6.1.2-2: NR Cell specific test parameters for SA Inter-RAT E-UTRAN RSRQ test parameters

Parameter		Unit	C	ell 1
NR RF channel number	<b>T</b>			1
Dunlex mode	Config 1, 4			DD
Buplox mode	Config 2, 3, 5, 6			DD
	Config 1, 4			N/A
R RF channel number  uplex mode  DD Configuration  Website and pattern Id  DSCH reference measurement annel  DRSET reference channel  WP configurations  CNG pattern Note1  MTC configuration  BB configuration  PRE ratio of PSS to SSS  PRE ratio of PBCH DMRS to SSS  PRE ratio of PBCH to PBCH DMR  PRE ratio of PDCCH DMRS to SS  PRE ratio of PDCCH DMRS to SS  PRE ratio of PDSCH DMRS to SS  PRE ratio of PDSCH DMRS to SS  PRE ratio of PDSCH TO PDSCH D  PRE ratio of DSCH TO PDSCH D  PRE ratio of OCNG DMRS to SSS   Config 2, 5			Conf.1.1	
	Config 3, 6			Conf.1.2
	Config 1, 4			= 52 (FDD)
BWchannel	Config 2, 5	MHz	10: N <sub>RB,c</sub>	= 52 (TDD)
	Config 3, 6		40: N <sub>RB,c</sub> =	= 106 (TDD)
Gap pattern Id				0
DDCCU reference macaurement	Config 1, 4		SR.1	.1 FDD
	Config 2, 5		SR.1	.1 TDD
channel	Config 3, 6		SR.2	.1 TDD
	Config 1, 4		CR.1	.1 FDD
CORSET reference channel	Config 2, 5	1		.1 TDD
	Config 3, 6	1		.1 TDD
	Initial DL BWP			WP.0.1
DUD 5 4	Dedicated DL BWP		DLB'	WP.1.1
BWP configurations	Initial UL BWP		ULBWP.0.1	
	Dedicated UL BWP		ULB'	WP.1.1
OCNG pattern <sup>Note1</sup>				P.1
SMTC configuration			SMTC.1	
	Config 1, 2, 4, 5			
SSB configuration	Config 3, 6	1		
EPRE ratio of PSS to SSS	<b>J</b> - <b>J</b> - , -			
	3	1		
		1		
		dB		0
		1		
Noc <sup>Note2</sup>	1.0	dBm/15 kHz		104
	Config 1, 2, 4, 5			
N <sub>oc</sub> <sup>Note2</sup>	Config 3, 6	dBm/SCS		
Ês/Noc	, 50, mg 5, 6	dB		
Ê <sub>s</sub> /l <sub>ot</sub> Note3		dB		
	Config 1, 2, 4, 5			
SS-RSRQ <sup>Note3</sup>	Config 3, 6	dBm/SCS		
	Config 1, 2, 4, 5			
SSB_RP <sup>Note3</sup>	Config 3, 6	dBm/SCS	SSB.1 FR1 SSB.2 FR1  0  -104 -104 -101 17 7 17 7 -87 -97 -84 -94 -87 -97 -84 -94	
	Config 1, 2, 4, 5	dBm/9.36 MHz	-58.96	-68.26
lo <sup>Note3</sup>	Config 3, 6	dBm/38.16 MHz	-52.87	-62.17
Propagation condition	Coming 3, 0	GDITI/30. TO IVITIZ		-02.17 VGN
Antenna Configuration and Correla	tion Matrix			1x2
Note 1: OCNG shall be used suc				

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

Note 3: Ê<sub>s</sub>/I<sub>ot</sub>, SS-RSRQ, SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table A.6.7.6.1.2-3: E-UTRAN Cell specific test parameters for SA Inter-RAT E-UTRAN RSRQ test parameters

Param	neter	Unit		Cell 2		
			Test 1 Test 2 Test 3			
E-UTRA RF channel numb	er			· · · · · · · · · · · · · · · · · · ·		
Duplex mode	Config 1, 2, 3			FDD		
	Config 4, 5, 6			TDD		
TDD special subframe	Config 1, 2, 3			N/A		
configuration <sup>Note1</sup>	Config 4, 5, 6			6		
TDD uplink-downlink	Config 1, 2, 3			N/A		
configuration <sup>Note1</sup>	Config 4, 5, 6			1		
BWchannel		MHz		$5 \text{ MHz: } N_{RB,c} = 25$		
				$10 \text{ MHz: } N_{RB,c} = 5$		
BB00H			2	$0 \text{ MHz: } N_{RB,c} = 10$	00	
PDSCH parameters:	1 Ol INote?			-		
DL Reference Measuremen				5 MUL D 44 EDE		
PCFICH/PDCCH/PHICH	Config 1, 2, 3			5 MHz: R.11 FDC		
parameters: DL Reference			10 MHz: R.6 FDD 20 MHz: R.10 FDD			
Measurement	Config 4, 5, 6	-	20 MHz: R.10 FDD 5 MHz: R.11 TDD			
Channel <sup>Note2</sup>	Corning 4, 5, 6		10 MHz: R.6 TDD			
Charlie			10 MHz: R.6 TDD 20 MHz: R.10 TDD 5 MHz: OP.19 FDD			
OCNG Patterns <sup>Note2</sup>	Config 1, 2, 3					
OCING Fatterns	Cornig 1, 2, 3			0 MHz: OP.6 FD		
				0 MHz: OP.14 FD		
	Config 4, 5, 6	-		MHz: OP.10 TD		
	J ., e, e		10 MHz: OP.2 TDD			
				0 MHz: OP.8 TD		
PBCH RA	PBCH RA					
PBCH RB						
PSS_RA						
SSS_RA						
PCFICH_RB						
PHICH_RA						
PHICH_RB		dB	0			
PDCCH_RA						
PDCCH_RB						
PDSCH_RA						
PDSCH_RB						
OCNG_RA <sup>Note3</sup>						
OCNG_RB <sup>Note3</sup>				T	T	
	Bands FDD_A Note 9, TDD_A				-119.5	
	Bands FDD_B1,				-119	
	FDD_B2 Note 10	-				
N <sub>oc</sub> Note4	Bands FDD_C, TDD_C	dBm/15kHz	-83	-104.70	-118.5	
	Bands FDD_D	-			-118	
	Bands FDD_E, FDD_F Note 7, TDD_E				-117.5	
		]			-116.5	
Bands FDD_H					-116	
Ê <sub>s</sub> /N <sub>oc</sub>		dB	-1.75	-4.0	-4.0	
Ê <sub>s</sub> /I <sub>ot</sub> Note5	T =	dB	-1.75	-4.0	-4.0	
	Bands FDD_A Note 9, TDD_A				-123.5	
RSRP <sup>Note5</sup>	Bands FDD_B1, FDD_B2 Note 10	dBm/15kHz	-84.75	-108.70	-123	
	Bands FDD_C, TDD_C	1			-122.5	
	Bands FDD_D				-122	

	Bands FDD E, FDD F				
	Note 7, TDD_E				-121.5
	Bands FDD_G Note 8				-120.5
	Bands FDD_H				-120
	Bands FDD_A Note 9, TDD_A				
	Bands FDD_B1, FDD_B2 Note 10				
RSRQ <sup>Note5</sup>	Bands FDD_C, TDD_C	dB	-14.76	-16.25	-16.25
Nong	Bands FDD_D	ub.	-14.70	-10.23	-10.23
	Bands FDD_E, FDD_F Note 7, TDD_E				
	Bands FDD_G Note 8				
	Bands FDD_H				
	Bands FDD_A Note 9, TDD_A				-90.26 + 10log(N <sub>RB,c</sub> /50)
	Bands FDD_B1, FDD_B2 Note 10				-89.76 + 10log(N <sub>RB,c</sub> /50)
	Bands FDD_C, TDD_C				-89.26 + 10log(N <sub>RB,c</sub> /50)
Io <sup>Note5</sup>	Bands FDD_D	dBm/Ch BW	-53 + 10log(N <sub>RB,c</sub> /50)	-75.46 + 10log(N <sub>RB,c</sub> /50)	-88.76 + 10log(N <sub>RB,c</sub> /50)
	Bands FDD_E, FDD_F Note 7, TDD_E		,		-88.26 + 10log(N <sub>RB,c</sub> /50)
	Bands FDD_G Note 8				-87.26 + 10log(N <sub>RB,c</sub> /50)
	Bands FDD_H				-86.76 + 10log(N <sub>RB,c</sub> /50)
Propagation Condition				AWGN	
Antenna Configuration and	Correlation Matrix			1x2	

- Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].
- Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.
- Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.
- Note 5:  $\hat{E}_s$ /I<sub>ot</sub>, RSRP, RSRQ and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 6: E-UTRA operating band groups are as defined in clause 3.5 of TS 36.133 [15].
- Note 7: For Band 26, the tests shall be performed with the carrier frequency of assigned E-UTRA channel bandwidth within 865-894 MHz.
- Note 8: Except Band 29.
- Note 9: Except Band 32, Band 75 and Band 76.
- Note 10: For Band 74, the tests shall be performed with the carrier frequency of the assigned E-UTRA channel bandwidth within 1475.9-1510.9 MHz.

#### A.6.7.6.1.3 Test Requirements

The SA inter-RAT E-UTRAN RSRQ measurement accuracy for cell 2 shall fulfil absolute requirement in clause 10.2.3.

#### A.6.7.7 E-UTRAN RS-SINR

#### A.6.7.7.1 SA: inter-RAT measurement accuracy with FR1 serving cell

#### A.6.7.7.1.1 Test Purpose and Environment

The purpose of this test is to verify that the E-UTRAN RS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.2.4 for SA inter-RAT E-UTRAN RS-SINR measurements.

#### A.6.7.7.1.2 Test parameters

In each test there are two cells: Cell 1 and Cell 2. Cell 1 is the NR PCell and Cell 2 is an E-UTRAN inter-RAT neighbour cell. Supported test configurations are shown in table A.6.7.7.1.2-1. The measurement accuracy of SA inter-RAT E-UTRAN RS-SINR are tested by using the parameters in A.6.7.7.1.2-2 and A.6.7.7.1.2-3.

Table A.6.7.7.1.2-1: Inter-RAT E-UTRAN RS-SINR supported test configurations with FR1 serving cell

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

Table A.6.7.7.1.2-2: NR Cell specific test parameters for SA Inter-RAT E-UTRAN RS-SINR test parameters

Parameter		Unit		
NR RF channel number			1	
Duplex mode	Config 1, 4		FDD	
Duplex Illode	Config 2, 3, 5, 6		TDD	
	Config 1, 4		N/A	
TDD Configuration	Config 2, 5		TDDConf.1.1	
-	Config 3, 6		TDDConf.1.2	
	Config 1, 4		10: N <sub>RB,c</sub> = 52 (FDD)	
BWchannel	Config 2, 5	MHz		
	Config 3, 6		1 FDD TDD N/A TDDConf.1.1 TDDConf.1.2 10: N <sub>RB,c</sub> = 52 (FDD) 10: N <sub>RB,c</sub> = 52 (TDD) 40: N <sub>RB,c</sub> = 106 (TDD) 0 SR.1.1 FDD SR.1.1 TDD SR.2.1 TDD CR.1.1 FDD CR.1.1 TDD CR.1.1 TDD CR.2.1 TDD UBWP.0.1 ULBWP.0.1 ULBWP.1.1 ULBWP.1.1 OP.1 SMTC.1 SSB.1 FR1 SSB.2 FR1  0  -104 -104 -101 17 17 -87 -84 -87 -84 -87 -84 -58.96 -52.87 AWGN 1x2	
Gap pattern Id	<u> </u>			
	Config 1, 4		SR.1.1 FDD	
PDSCH reference measurement	Config 2, 5			
channel	Config 3, 6			
	Config 1, 4			
CORSET reference channel	Config 2, 5			
P configurations  NG pattern <sup>Note1</sup> TC configuration	Config 3, 6	1		
	Initial DL BWP			
	Dedicated DL BWP			
BWP configurations	Initial UL BWP			
	Dedicated UL BWP			
OCNG patternNote1	Dedicated OL DVVI			
SWITC configuration	Config 1, 2, 4, 5			
SSB configuration	Config 1, 2, 4, 5	<del> </del>		
EDDE ratio of DSS to SSS	Cornig 3, 6		33B.2 FK1	
	,	_		
EPRE ratio of PBCH to PBCH_DMF		_		
		-		
EPRE ratio of PDCCH_DMRS to S		-ID	0	
EPRE ratio of PDCCH to PDCCH_[		dB	Ü	
EPRE ratio of PDSCH_DMRS to SS				
EPRE ratio of PDSCH to PDSCH_E				
EPRE ratio of OCNG DMRS to SSS				
EPRE ratio of OCNG to OCNG DM	RS			
N <sub>oc</sub> Note2	1	dBm/15 kHz		
N <sub>oc</sub> Note2	Config 1, 2, 4, 5	dBm/SCS —		
	Config 3, 6			
Ês/Noc		dB		
Ês/Iot <sup>Note3</sup>		dB		
SS-RS-SINR <sup>Note3</sup>	Config 1, 2, 4, 5	dBm/SCS		
SO-INO-SININ	Config 3, 6	ubili/303		
SSB_RP <sup>Note3</sup>	Config 1, 2, 4, 5	dPm/SCS	-87	
SSD_KF	Config 3, 6	dBm/SCS —	-84	
ONote3	Config 1, 2, 4, 5	dBm/9.36 MHz	-58.96	
0.1000	Config 3, 6	dBm/38.16 MHz		
Propagation condition	, ,,,			
Antenna Configuration and Correlat	ion Matrix			
Note 1: OCNG shall be used suc		ılly allocated and a co		

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

Note 3: Ê<sub>s</sub>/I<sub>ot</sub>, SS-RS-SINR, SSB\_RP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table A.6.7.7.1.2-3: E-UTRAN Cell specific test parameters for SA Inter-RAT E-UTRAN RS-SINR test parameters

Parameter		Unit	Cell 2			
			Test 1 Test 2 Test 3			
E-UTRA RF channel numb	per			1		
Duplex mode	Config 1, 2, 3			FDD		
	Config 4, 5, 6			TDD		
TDD special subframe	Config 1, 2, 3			N/A		
configuration <sup>Note1</sup>	Config 4, 5, 6			6		
TDD uplink-downlink	Config 1, 2, 3			N/A		
configuration <sup>Note1</sup>	Config 4, 5, 6			1		
BW <sub>channel</sub>		MHz		5 MHz: N <sub>RB,c</sub> = 25	5	
				10 MHz: N <sub>RB,c</sub> = 5		
			2	$0 \text{ MHz: } N_{RB,c} = 10$	00	
PDSCH parameters:				-		
DL Reference Measureme						
PCFICH/PDCCH/PHICH	Config 1, 2, 3			5 MHz: R.11 FDD		
parameters:				10 MHz: R.6 FDD		
DL Reference		_		20 MHz: R.10 FDI		
Measurement	Config 4, 5, 6			5 MHz: R.11 TDD		
Channel <sup>Note2</sup>				10 MHz: R.6 TDD		
			20 MHz: R.10 TDD			
OCNG Patterns <sup>Note2</sup>	Config 1, 2, 3		5 MHz: OP.19 FDD 10 MHz: OP.6 FDD 20 MHz: OP.14 FDD			
		_				
	Config 4, 5, 6		-	5 MHz: OP.10 TDD		
			10 MHz: OP.2 TDD			
DROLL DA			2	0 MHz: OP.8 TD	ט	
PBCH_RA		-				
PBCH_RB		-				
PSS_RA						
SSS_RA						
PCFICH_RB		-				
PHICH_RA						
PHICH_RB		dB	0			
PDCCH_RA						
PDCCH_RB		-				
PDSCH_RA						
PDSCH_RB						
OCNG_RANote3						
OCNG_RB <sup>Note3</sup>	I - Note 0			T	T	
	Bands FDD_A Note 9, TDD_A				-119.5	
	Bands FDD_B1, FDD_B2 Note 10				-119	
NI Note4	Bands FDD_C, TDD_C	alDina/4.51-11-	00	400.50	-118.5	
N <sub>oc1</sub> Note4	Bands FDD_D	dBm/15kHz	-88	-108.50	-118	
	Bands FDD_E, FDD_F	]			-117.5	
	Bands FDD_G Note 8	1			-116.5	
	Bands FDD H	1			-116	
	Bands FDD_A Note 9,				-113.5	
	TDD_A Bands FDD_B1,	-			-113	
N <sub>oc2</sub> Note4a	FDD_B2 Note 10	dBm/15kHz	-82	-114.5		
I NOCZ	Bands FDD_C, TDD_C	ADIII/ IONI IZ	-02	-114.5	-112.5	
	Bands FDD_D	]			-112	
	Bands FDD_E, FDD_F				-111.5	
	Note 7, TDD_E				-111.0	

	Bands FDD_G Note 8				-110.5
	Bands FDD_H				-110
CRS Ê <sub>s</sub> /N <sub>oc1</sub>		dB	-1.75	-4.0	-4.0
CRS Ê <sub>s</sub> /I <sub>ot</sub> Note5		dB	-1.75	-4.0	-4.0
	Bands FDD_A Note 9, TDD_A				-123.5
	Bands FDD_B1, FDD_B2 Note 10				-123
RSRP <sup>Note5</sup>	Bands FDD_C, TDD_C	dBm/15kHz	-89.75	-88.50	-122.5
	Bands FDD_D				-122
	Note 7, TDD E				-121.5
					-120.5
					-120
		-			
RS-SINR <sup>Note5</sup>	FDD R2 Note 10				
N		1			
RS-SINR <sup>Note5</sup>		dB	-1.75	20	-4.0
	Bands FDD E, FDD F				
	Bands FDD G Note 8				
	Bands FDD_H				
	Bands FDD_A Note 9, TDD_A				-93.48 + 10log(N <sub>RB,c</sub> /50)
	Bands FDD_B1, FDD_B2 Note 10				-92.98 + 10log(N <sub>RB,c</sub> /50)
	Bands FDD_C, TDD_C				-92.48 + 10log(N <sub>RB,c</sub> /50)
Io <sup>Note5</sup>	Bands FDD_D	dBm/Ch BW	-53.79 + 10log(N <sub>RB,c</sub> /50)	-60.56 + 10log(N <sub>RB,c</sub> /50)	-91.98 + 10log(N <sub>RB,c</sub> /50)
	Bands FDD_E, FDD_F Note 7, TDD_E				-91.48 + 10log(N <sub>RB,c</sub> /50)
	Bands FDD_E, FDD_F Note 7, TDD_E Bands FDD_G Note 8 Bands FDD_H Bands FDD_A Note 9, TDD_A Bands FDD_B1, FDD_B2 Note 10 Bands FDD_D Bands FDD_E, FDD_F Note 7, TDD_E Bands FDD_H Bands FDD_B1, FDD_B2 Note 8 Bands FDD_H Bands FDD_B1, FDD_B2 Note 9, TDD_A Bands FDD_B1, FDD_B2 Note 10 Bands FDD_C, TDD_C Bands FDD_B1, FDD_B2 Note 10 Bands FDD_C, TDD_C Bands FDD_D Bands FDD_C, TDD_C Bands FDD_D Bands FDD_D Bands FDD_D Bands FDD_D Bands FDD_C, TDD_C Bands FDD_D Bands FDD_B1, FDD_B2 Note 10 Bands FDD_C, TDD_C Bands FDD_D Bands FDD_D Bands FDD_B1, FDD_B2 Note 10 Bands FDD_D Bands FDD_B			-90.48 + 10log(N <sub>RB,c</sub> /50)	
	Bands FDD_H				-89.98 + 10log(N <sub>RB,c</sub> /50)
Propagation Condition				AWGN	
Antenna Configuration and	Correlation Matrix			1x2	

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].

Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.

Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over CRS subcarriers and time and shall be modelled as AWGN of appropriate power for Noc1 to be fulfilled.

Note 4a: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers other than CRS subcarriers and time and shall be modelled as AWGN of appropriate power for Noc2 to be fulfilled.

Note 5: CRS Ê<sub>s</sub>/I<sub>ot</sub>, RSRP, RS-SINR and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 6: E-UTRA operating band groups are as defined in clause 3.5 of TS 36.133 [15].

Note 7: For Band 26, the tests shall be performed with the carrier frequency of assigned E-UTRA channel bandwidth within 865-894 MHz.

Note 8: Except Band 29.

Note 9: Except Band 32, Band 75 and Band 76.

Note 10: For Band 74, the tests shall be performed with the carrier frequency of the assigned E-UTRA channel

bandwidth within 1475.9-1510.9 MHz.

#### A.6.7.7.1.3 Test Requirements

The SA inter-RAT E-UTRAN RS-SINR measurement accuracy for cell 2 shall fulfil absolute requirement in clause 10.2.4.

# A.7 NR standalone tests with one or more NR cells in FR2

## A.7.1 SA: RRC\_IDLE state mobility

#### A.7.1.1 Cell re-selection to NR

#### A.7.1.1.1 Cell reselection to FR2 intra-frequency NR case

#### A.7.1.1.1 Test Purpose and Environment

This test is to verify the requirement for the intra frequency NR cell reselection requirements specified in clause 4.2.2.3.

#### A.7.1.1.2 Test Parameters

The test scenario comprises of 1 NR carrier and 2 cells as given in tables A.7.1.1.1.2-1, A.7.1.1.1.2-2 and A.7.1.1.1.2-3. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. Only cell 1 is already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing cell 2.

Table A.7.1.1.1.2-1: Supported test configurations

	Configuration	Description				
1		120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode				
2		240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode				
Note:	Note: The UE is only required to be tested in one of the supported test configurations.					

Table A.7.1.1.1.2-2: General test parameters for intra frequency NR cell re-selection test case

	Parameter	Unit	Test configuration	Value	Comment
Initial	Active cell		1, 2	Cell1	
condition	Neighbour cells		1, 2	Cell2	
T2 end	Active cell		1, 2	Cell2	
condition	Neighbour cells		1, 2	Cell1	
Final condition	Visited cell		1, 2	Cell1	
RF Channe	el Number		1, 2	1	
Time offse	t between cells		1, 2	3 μs	Synchronous cells
Access Ba	rring Information	-	1, 2	Not Sent	No additional delays in random access procedure.
SSB config	guration		1	SSB.1 FR2	
			2	SSB.2 FR2	
SMTC con	SMTC configuration		1, 2	SMTC pattern 1	
DRX cycle	DRX cycle length		1, 2	1.28	The value shall be used for all cells in the test.
PRACH co	onfiguration index		1, 2	190 The detailed configuration is spe TS 38.211 clause 6.3.3.2	
rangeToBe	estCell		1, 2	Not configured	
T1		S	1, 2	>7	During T1, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed, The intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T2
T2		S	1, 2	135	T2 needs to be defined so that cell reselection reaction time is taken into account.
Т3		s	1, 2	35	T3 needs to be defined so that cell reselection reaction time is taken into account.

Table A.7.1.1.2-3: Cell specific test parameters for intra frequency NR cell re-selection test case in AWGN

Parameter	Unit	Test	Cell 1			Cell 2			
		configuration	T1	T2	T3	T1	T2	T3	
TDD configuration		1, 2	T	DDConf.3.	1	Т	DDConf.3.	.1	
PDSCH RMC		1		R.3.1 TDD			N/A		
configuration		2		R.3.1 TDD					
RMSI CORESET		1		R.3.1 TDD			R.3.1 TDI		
RMC configuration		2	CR.3.1 TDD CR.3.1 TDD					0	
Dedicated CORESET		1	C	CR.3.1 TDI	D	C	CR.3.1 TD	Q	
RMC configuration		2	C	CR.3.1 TDI	D	C	CR.3.1 TD	Q	
OCNG Pattern		1, 2	OP.1 d	lefined in A	3.2.1	OP.1 d	lefined in A	٩.3.2.1	
Initial DL BWP		1, 2		DLBWP.0.1			LBWP.0.	1	
configuration									
Initial UL BWP		1, 2	Ĺ	JLBWP.0.1		Ų	JLBWP.0.	1	
configuration									
RLM-RS		1, 2		SSB			SSB		
Qrxlevmin	dBm/SCS	1		-140			-140		
		2	-137			-137			
Pcompensation	dB	1, 2	0			0			
Qhyst <sub>s</sub>	dB	1, 2	0			0			
Qoffset <sub>s, n</sub>	dB	1, 2		0		0			
Cell_selection_and_		1, 2							
reselection_quality_				SS-RSRP		SS-RSRP			
measurement									
AoA setup		1, 2	Cotup 1	defined in A	N 2 15 1	Setup 1 defined in A.3.15.1			
			Setup 1	ueillieu III <i>i</i>	4.3.13.1	Setup 1 defined in A.S. 15.1		A.S. 15.1	
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	1	8	-3.64	1.81	-infinity	1.81	-3.64	
s / ot		2							
M Note2	dBm/SCS	1			-93				
$N_{oc}$ Note2		2			-90				
M. Natio	dBm/15 kHz	1			-102	2			
$N_{oc}$ Note2		2							
$\hat{E}_s/N_{oc}$	dB	1	8	5	8	-infinity	8	5	
= s / 1 · oc		2				,			
SS-RSRP Note3	dBm/SCS	1	-85	-88	-85	-infinity	-85	-88	
		2	-82	-85	-82	-infinity	-82	-85	
lo	dBm/95.04 MHz	1	-55.37	-53.81	-53.81	-55.37	-53.81	-53.81	
		2	-52.37 -50.81 -50.81		-52.37	-50.81	-50.81		
Treselection	S	1, 2	0	0	0	0	0	0	
SintrasearchP	dB	1, 2	-	50			50		
Propagation		1, 2	AWGN						
Condition		-, -			•				

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers

and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

#### A.7.1.1.3 Test Requirements

The cell reselection delay to a newly detectable cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 2.

The cell re-selection delay to a newly detectable cell shall be less than 130 s.

The cell reselection delay to an already detected cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on cell 1, and starts to send preambles on the PRACH for sending the RRCSetupRequest message to perform a Tracking Area Update procedure on cell 1.

The cell re-selection delay to an already detected cell shall be less than 27 s.

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

The cell re-selection delay to a newly detectable cell can be expressed as: T<sub>detect, NR Intra</sub> + T<sub>SI-NR</sub>, and to an already detected cell can be expressed as: T<sub>evaluate, NR intra</sub> + T<sub>SI-NR</sub>,

#### Where:

Tdetect, NR Intra See Table 4.2.2.3-1 in clause 4.2.2.3  $T_{evaluate,\;NR\_\;intra}$ See Table 4.2.2.3-1 in clause 4.2.2.3

 $T_{SI-NR}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE

to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 129.28 s, allow 130 s for the cell re-selection delay to a newly detectable cell and 26.88 s for the cell re-selection delay to an already detected cell in the test case, which we allow 27 s.

#### A.7.1.1.2 Cell reselection to FR2 inter-frequency NR case

#### A.7.1.1.2.1 Test Purpose and Environment

This test is to verify the requirement for the inter frequency NR cell reselection requirements specified in clause 4.2.2.4.

#### A.7.1.1.2.2 **Test Parameters**

The test scenario comprises of 2 cells on 2 different NR carriers respectively as given in tables A.7.1.1.2.2-1, A.7.1.1.2.2-2 and A.7.1.1.2.2-3. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas and cell 2 is of higher priority than cell 1. Furthermore, UE has not registered with network for the tracking area containing cell 2.

Table A.7.1.1.2.2-1: Supported test configurations

	Configuration	Description for serving cell	Description for target cell					
1		120 kHz SSB SCS, 100 MHz bandwidth,	120 kHz SSB SCS, 100 MHz bandwidth, TDD					
		TDD duplex mode	duplex mode					
2		240 kHz SSB SCS, 100 MHz bandwidth,	240 kHz SSB SCS, 100 MHz bandwidth, TDD					
		TDD duplex mode	duplex mode					
Not	e: The UE is o	The UE is only required to be tested in one of the supported test configurations.						

Table A.7.1.1.2.2-2: General test parameters for FR2 inter frequency NR cell re-selection test case

Parameter		Unit Test configuration		Value	Comment			
Initial condition	Active cell		1, 2	Cell2	The UE camps on cell 2 in the initial phase and during T1 period the UE reselects to cell 1			
T1 end	Active cell		1, 2	Cell1	The UE shall perform reselection to cell 1			
condition	Neighbour cells		1, 2	Cell2	during T1			
T3 end condition	Active cell		1, 2	Cell2	The UE shall perform reselection to cell 2 with higher priority during T3			
RF Channel Number			1, 2	1, 2				
	Time offset between cells		1, 2	3 μs	Synchronous cells			
Access Barring Information		-	1, 2	Not Sent	No additional delays in random access procedure.			
SSB configuration			1	SSB.1 FR2				
			2	SSB.2 FR2				
SMTC configuration			1, 2	SMTC pattern 1				
DRX cycle length		S	1, 2	1.28	The value shall be used for all cells in the test.			
PRACH configuration index			1, 2	190	The detailed configuration is specified in TS 38.211 clause 6.3.3.2			
rangeToBestCell			1, 2	Not configured				
T1		S	1, 2	35	T1 needs to be defined so that cell reselection reaction time is taken into account.			
T2		S	1, 2	>7	During T2, cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that cell 2 has not been detected by the UE prior to the start of period T3.			
Т3		s	1, 2	95	T3 needs to be defined so that cell reselection reaction time is taken into account.			

Table A.7.1.1.2.2-3: Cell specific test parameters for FR2 inter frequency NR cell re-selection test case in AWGN

Parameter	Unit Test Cell 1			Cell 2				
		configuration	T1	T2	Т3	T1	T2	Т3
TDD configuration		1, 2	Т	DDConf.3.		Т	DDConf.3.	1
PDSCH RMC		1, 2	SR.3.1 TDD			N/A		
configuration								
RMSI CORESET		1, 2	CR.3.1 TDD		CR.3.1 TDD			
parameters								
RMSI CORESET		1, 2	CCR.3.1 TDD			CCR.3.1 TDD		
RMC configuration								
OCNG Pattern		1, 2 1, 2	OP.1 defined in A.3.2.1			OP.1 defined in A.3.2.1		
Initial DL BWP		1, 2	DLBWP.0.1		DLBWP.0.1			
configuration								
Initial UL BWP		1, 2	ULBWP.0.1		ULBWP.0.1			
configuration								
RLM-RS		1, 2		SSB		SSB		
Qrxlevmin	dBm/SCS	1	-140 -137		-140			
		2				-137		
Pcompensation	dB	1, 2	0		0			
Qhysts	dB	1, 2	0			0		
Qoffset <sub>s, n</sub>	dB	1, 2	0			0		
Cell_selection_and_		1, 2						
reselection_quality_			SS-RSRP		SS-RSRP			
measurement								
AoA setup		1, 2	Setup 1 defined in A.3.15.1		\ 3 15 1	Setup 1 defined in A.3.15.1		
					4.5.15.1			
$\hat{E}_s/I_{ot}$	dB	1	8	8	8	-3	-infinity	8
s / ot		2					-	
M Note2	dBm/SCS	1	-93 -90					
$N_{oc}$ Note2		2						
M Note2	dBm/15 kHz	1	-102					
$N_{oc}$ Note2		2						
$\hat{E}_s/N_{oc}$	dB	1	15	15	15	-3	-infinity	13
-s/oc		2						
SS-RSRP Note3	dBm/SCS	1	-85	-85	-85	-96	-infinity	-85
		2	-82	-82	-82	-93	-infinity	-82
lo	dBm/95.04 MHz	1	-55.37	-55.37	-55.37	-62.25	-infinity	-55.37
		2	-52.37	-52.37	-52.37	-59.25	-infinity	-52.37
Treselection	S	1, 2	0	0	0	0	0	0
SnonintrasearchP	dB	1, 2	50		Not sent			
Thresh <sub>x, high</sub>	dB	1, 2	48		48			
Thresh <sub>serving, low</sub>	dB	1, 2	44		44			
Thresh <sub>x, low</sub>	dB	1, 2	50			50		
Propagation		1, 2	AWGN					
Condition								

Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers Note 2:

and time and shall be modelled as AWGN of appropriate power for  $\frac{N_{oc}}{N_{oc}}$  to be fulfilled. SS-RSRP levels have been derived from other parameters for information purposes. They are not settable

Note 3: parameters themselves.

#### A.7.1.1.2.3 Test Requirements

The cell reselection delay to a higher priority cell is defined as the time from the beginning of time period T3, to the moment when the UE camps again on cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to a higher priority cell shall be less than 87 s.

The cell reselection delay to a lower priority cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on cell 1.

The cell re-selection delay to a lower priority cell shall be less than 27 s.

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

NOTE: The cell re-selection delay to a higher priority cell can be expressed as:  $T_{higher\_priority\_search} + T_{evaluate, NR\_inter} + T_{SI-NR}$ , and to a lower priority cell can be expressed as:  $T_{evaluate, NR\_inter} + T_{SI-NR}$ ,

#### Where:

Thigher priority search See clause 4.2.2.7

T<sub>evaluate, NR inter</sub> See Table 4.2.2.4-1 in clause 4.2.2.4

T<sub>SI-NR</sub> Maximum repetition period of relevant system info blocks that needs to be received by the UE

to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 86.88 s, allow 87 s for the cell re-selection delay to a higher priority cell and 26.88 s for the cell re-selection delay to a lower priority cell in the test case, which we allow 27 s.

## A.7.2 SA: RRC\_INACTIVE state mobility

## A.7.3 RRC\_CONNECTED state mobility

#### A.7.3.1 Handover

#### A.7.3.1.1 Inter-frequency handover from FR1 to FR2; unknown target cell

#### A.7.3.1.1.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR1-NR FR2 inter frequency handover requirements specified in clause 6.1.1.5.

#### A.7.3.1.1.2 Test Parameters

Supported test configurations are shown in table A.7.3.1.2.2-1. Both handover delay and interruption length are tested by using the parameters in table A.7.3.1.1.2-2, and A.7.3.1.1.2-3.

The test scenario comprises of two carriers and one cell on each carrier. No gap patterns are configured in the test case. The test consists of two successive time periods, with time durations of T1, T2 respectively. At the start of time duration T1, the UE does not have any timing information of cell 2. Starting T2, cell 2 becomes detectable and the UE receives a RRC handover command from the network. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

Table A.7.3.1.1.2-1: Inter-frequency handover from FR1 to FR2 test configurations

Config	Description
1	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
	Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
	Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
3	Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
	Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is onl	y required to be tested in one of the supported test configurations

Table A.7.3.1.1.2-2: General test parameters Inter-frequency handover from FR1 to FR2

Pa	rameter	Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
A4-Offset		dBm	[-120]	
Hysteresis		dB	0	
Time To Trigger		S	0	
Filter coefficient			0	L3 filtering is not used
Access Barring In	formation	-	Not Sent	No additional delays in random access procedure.
Time offset betwe	en cells		3 μs	Synchronous cells
T1		S	5	
T2		S	≤10	

Table A.7.3.1.1.2-3: Cell specific test parameters for NR FR1-FR2 Inter frequency handover test case

Parameter	Unit	Cell 1		Cell 2	
Parameter		T1	T2	T1	T2
NR RF Channel Number		,	1	2	2

	Config 1		FDD	TDD		
Duplex mode	Config 2,3		TDD	TDD		
	Config 1		Not Applicable	TDDConf.3.1		
TDD configuration	Config 2		TDDConf.1.1	TDDConf.3.1		
	Config 3		TDDConf.2.1	TDDConf.3.1		
	Config 1		10: N <sub>RB,c</sub> = 52	100: N <sub>RB,c</sub> = 66		
BW <sub>channel</sub>	Config 2	MHz	10: N <sub>RB,c</sub> = 52	100: N <sub>RB,c</sub> = 66		
	Config 3		40: N <sub>RB,c</sub> = 106	100: N <sub>RB,c</sub> = 66		
	Config 1		10: N <sub>RB,c</sub> = 52	100: N <sub>RB,c</sub> = 66		
BWP BW	Config 2	MHz	10: N <sub>RB,c</sub> = 52	100: N <sub>RB,c</sub> = 66		
	Config 3		$40: N_{RB,c} = 106$	100: N <sub>RB,c</sub> = 66		
DRx Cycle	1	ms	Not Ap	· · · · · · · · · · · · · · · · · · ·		
<u> </u>						
	Config 1		SR.1.1 FDD	SR3.1 TDD		
PDSCH Reference measurement channel	Config 2		SR.1.1 TDD	SR3.1 TDD		
	Config 3		SR2.1 TDD	SR3.1 TDD		
	Config 1		CR.1.1 FDD	CR3.1 TDD		
CORESET Reference Channel	Config 2		CR.1.1 TDD	CR3.1 TDD		
	Config 3		CR2.1 TDD	CR3.1 TDD		
OCNG Patterns			OCNG p	pattern 1		
CCD configuration	Config 1,2		SSB.1 FR1	SSB.1 FR2		
SSB configuration	Config 3		SSB.2 FR1	SSB.1 FR2		
SSP configuration	Config 1,2		SSB.1 FR1	SSB.1 FR2		
SSB configuration	Config 3		SSB.2 FR1	SSB.1 FR2		
SMTC configuration	Config 1,2		SMTC.1	SMTC.1		
Sivi 1 C corniguration	Config 3		SMTC.2	SMTC.1		
PDSCH/PDCCH	Config 1,2	kHz	15 kHz	120 kHz		
subcarrier spacing	Config 3	NI IZ	30 kHz	120 kHz		
PUCCH/PUSCH	Config 1,2	kHz	15 kHz	120 kHz		
subcarrier spacing	Config 3	KIIZ	30 kHz	120 kHz		
PRACH configuration			FR1 PRACH configuration	FR2 PRACH configuration		
TRS configuration	Config 1		TRS.1.1 FDD	TRS.2.1 TDD		
	Config 2	-	TRS.1.1 TDD	TRS.2.1 TDD		
TCI configuration	Config 3		TRS.1.2 TDD N/A	TRS.2.1 TDD CSI-RS.Config.0		
BWP configuration	Initial DL BWP		DLBWP.0.1	DLBWP.0.1		
<b>3</b>	Dedicated DL		DLBWP.1.1	DLBWP.1.1		
	BWP Initial UL BWP		ULBWP.0.1	ULBWP.0.1		
	Dedicated UL BWP		ULBWP.1.1	ULBWP.1.1		
EPRE ratio of PSS to SS EPRE ratio of PBCH DM		dB	0	0		

EPRE ratio	o of PBCH to PBCH DMRS				
	o of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS					
EPRE ratio	o of PDSCH DMRS to SSS				
EPRE ratio	o of PDSCH to PDSCH				
EPRE ratio	o of OCNG DMRS to SSS(Note 1)				
EPRE ratio	o of OCNG to OCNG DMRS (Note				
1)					
$N_{oc}^{ m Note2}$		dBm/15kH		-10	4.7
1 ' oc	1 voc				
$N_{oc}^{$	Config 1,2			-95.7	
IV <sub>oc</sub>	Config 3	dBm/SCS	NA	-95	5.7
$\hat{\mathrm{E}}_{_{\mathrm{s}}}/\mathrm{I}_{_{\mathrm{ot}}}$		dB	Link only, see clause	-Infinity	10
$\hat{E}_s/N_{oc}$		dB	A.3.7A	-Infinity	10
IoNote3	Config 1,2	dBm/ BW		-66.7	-55.4
Config 3		dBm/ BW		-66.7	-55.4
Propagation	on condition	-		AW	GN

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.
- Note 3: lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
- Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone

### A.7.3.1.1.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than [562] ms from the beginning of time period T2. The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay + T<sub>interrupt</sub>, where:

RRC procedure delay = [10] ms and is specified in clause 12 in TS 38.331 [2].

 $T_{interrupt} = [552]$  ms in the test.  $T_{interrupt}$  is defined in clause 6.1.1.5.2.

This gives a total of [562] ms.

### A.7.3.1.2 Intra-frequency handover from FR2 to FR2; unknown target cell

### A.7.3.1.2.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR2-NR FR2 intra frequency handover requirements specified in clause 6.1.1.4.

### A.7.3.1.2.2 Test Parameters

Supported test configurations are shown in table A.7.3.1.2.2-1. Both handover delay and interruption length are tested by using the parameters in table A.7.3.1.2.2-2, and A.7.3.1.2.2-3.

The test scenario comprises of carriers and one cell on each carrier. No gap patterns are configured in the test case. The test consists of two successive time periods, with time durations of T1, T2 respectively. At the start of time duration T1, the UE does not have any timing information of cell 2. Starting T2, cell 2 becomes detectable and the UE receives a RRC handover command from the network. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

Table A.7.3.1.2.2-1: Intra-frequency handover from FR2 to FR2 test configurations

Config	Description
1	Source cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
	Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode

Table A.7.3.1.2.2-2: General test parameters Intra-frequency handover from FR2 to FR2

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
A4-Offset		dBm	-120	
Hysteresis		dB	0	
Time To Trigger		S	0	
Filter coefficient			0	L3 filtering is not used
Access Barring In	formation	-	Not Sent	No additional delays in random access procedure.
Time offset betwe	en cells		3 μs	Synchronous cells
T1		S	5	
T2		S	≤10	

Table A.7.3.1.2.2-3: Cell specific test parameters for NR FR2-FR2 Intra frequency handover test case

Dovo	matar	Unit	Ce	ell 1	Cell 2	
Parameter		Unit	T1	T2	T1	T2
NR RF Channel Numb	NR RF Channel Number			1	1	
Duplex mode			TDD			
TDD configuration				TDDC		
BW <sub>channel</sub>		MHz			<sub>RB,c</sub> = 66	
BWP BW		MHz		100: N <sub>F</sub>	<sub>RB,c</sub> = 66	
DRx Cycle		ms		Not Ap	plicable	
PDSCH Reference me	easurement channel			SR3.1	1 TDD	
CORESET Reference	Channel			CR3.	1 TDD	
OCNG Patterns			OCNG pattern 1			
SMTC Configuration			SMTC pattern 1			
SSB Configuration	SSB Configuration			SSB.	1 FR2	
	PDSCH/PDCCH subcarrier spacing			120	kHz	
PUCCH/PUSCH subc		kHz			kHz	
PRACH configuration				FR2 PRACH		
TRS configuration					.1 TDD	
TCI configuration				CSI-RS.	Config.0	
BWP configuration	Initial DL BWP			DLBV		
	Dedicated DL BWP			DLBV	/P.1.1	
	Initial UL BWP			ULBV	/P.0.1	
	Dedicated UL BWP		ULBWP.1.1			
EPRE ratio of PSS to SSS						<del></del>
EPRE ratio of PBCH [	DMRS to SSS	dB	0		0	
EPRE ratio of PBCH t		uБ	'	U	0	
EPRE ratio of PDCCH	I DMRS to SSS					

EPRE ratio	o of PDCCH to PDCCH DMRS					
EPRE ratio	o of PDSCH DMRS to SSS					
EPRE ratio	o of PDSCH to PDSCH					
EPRE ratio	EPRE ratio of OCNG DMRS to SSS(Note 1)					
EPRE ration 1)	o of OCNG to OCNG DMRS (Note					
$N_{ac}^{\rm Note2}$			-10	4.7	-10	4.7
TV <sub>oc</sub>		Z				
λτ Note2	Config 1,2		-95.7 -95.7		-95.7	
TV <sub>oc</sub>	$N_{oc}^{\text{Note2}}$ Config 3				-95.7	
${ m \hat{E}}_{_{ m s}}/{ m I}_{_{ m ot}}$		dB	6	-1.8	-Infinity	0
$\hat{E}_s/N_{oc}$		dB	6	6	-Infinity	7
Io <sup>Note3</sup>	Config 1,2	dBm/ BW	-59.7	-56.7	-59.7	-56.7
10.15.50	Config 3	dBm/ BW	-59.7	-56.7	-59.7	-56.7
Propagation	on condition	-		AW	'GN	

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.
- Note 3: lo levels have been derived from other parameters for information purposes. They are not settable
  - parameters themselves.
- Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the guiet zone
- Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone

### A.7.3.1.2.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 222 ms from the beginning of time period T2. The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay + T<sub>interrupt</sub>, where:

RRC procedure delay = 10 ms and is specified in clause 12 in TS 38.331 [2].

 $T_{interrupt} = 212$  ms in the test.  $T_{interrupt}$  is defined in clause 6.1.1.4.2.

This gives a total of 222 ms.

### A.7.3.1.3 Inter-frequency handover from FR2 to FR2; unknown target cell

### A.7.3.1.3.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR2-NR FR2 inter frequency handover requirements specified in clause 6.1.1.4.

### A.7.3.1.3.2 Test Parameters

Supported test configurations are shown in table A.7.3.1.3.2-1. Both handover delay and interruption length are tested by using the parameters in table A.7.3.1.3.2-2, and A.7.3.1.3.2-3.

The test scenario comprises of carriers and one cell on each carrier. No gap patterns are configured in the test case. The test consists of two successive time periods, with time durations of T1, T2 respectively. At the start of time duration T1, the UE does not have any timing information of cell 2. Starting T2, cell 2 becomes detectable and the UE receives a RRC handover command from the network. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

Table A.7.3.1.3.2-1: Inter-frequency handover from FR2 to FR2 test configurations

Config	Description
1	Source cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
	Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode

Table A.7.3.1.3.2-2: General test parameters Inter-frequency handover from FR2 to FR2

Pai	Parameter		Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
A4-Offset		dB	[-120]	
Hysteresis		dB	0	
Time To Trigger		S	0	
Filter coefficient			0	L3 filtering is not used
Access Barring In	formation	-	Not Sent	No additional delays in random
				access procedure.
Time offset betwe	en cells		3 μs	Synchronous cells
T1		S	5	
T2		S	≤10	

Table A.7.3.1.3.2-3: Cell specific test parameters for NR FR2-FR2 Inter frequency handover test case

Parameter		Unit	Ce	II 1	Cell 2		
Para	meter	Unit	T1	T2	T1	T2	
NR RF Channel Number				1 2			
Duplex mode		TDD					
TDD configuration				TDDC			
BW <sub>channel</sub>		MHz			<sub>B,c</sub> = 66		
BWP BW		MHz		100: N <sub>R</sub>	<sub>B,c</sub> = 66		
DRx Cycle		ms		Not App	olicable		
PDSCH Reference me	easurement channel			SR3.1	TDD		
CORESET Reference	Channel			CR3.1	TDD		
OCNG Patterns				OCNG p	attern 1		
SMTC Configuration				SMTC p	attern 1		
SSB Configuration				SSB.	l FR2		
PDSCH/PDCCH subc	arrier spacing	kHz	120 kHz				
PUCCH/PUSCH subc		kHz	120 kHz				
PRACH configuration			FR2 PRACH configuration 1				
TRS configuration			TRS.2.1 TDD				
TCI configuration				CSI-RS.	Config.0		
BWP configuraiton	Initial DL BWP			DLBW	/P.0.1		
	Dedicated DL BWP			DLBW	/P.1.1		
	Initial UL BWP			ULBW			
	Dedicated UL BWP			ULBW	/P.1.1		
EPRE ratio of PSS to							
EPRE ratio of PBCH [							
EPRE ratio of PBCH t							
EPRE ratio of PDCCH DMRS to SSS							
EPRE ratio of PDCCH		dB		)	0		
EPRE ratio of PDSCH			]	•	O		
EPRE ratio of PDSCH							
	DMRS to SSS(Note 1)						
	to OCNG DMRS (Note						
1)							

$N_{oc}^{ m Note2}$		dBm/15kH z	-104.7		-104.7		
λ./ Note2	Config 1,2	dPm/SCS	-95	5.7	-95.7		
$N_{oc}^{ m Note2}$	Config 3	dBm/SCS	-95.7		-95.7		
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$		dB	5	5	-Infinity	5	
$\hat{E}_s/N_{oc}$	$\hat{E}_s/N_{oc}$		5	5	-Infinity	5	
Io <sup>Note3</sup>	Config 1,2	dBm/ BW	-60.5	-60.5	-66.7	-60.5	
10 3	Config 3	dBm/ BW	-60.5	-60.5	-66.7	-60.5	
Propagation condition		-	AWGN				

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.
- Note 3: lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
- Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone

### A.7.3.1.3.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 542 ms from the beginning of time period T2. The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay + T<sub>interrupt</sub>, where:

RRC procedure delay = 10 ms and is specified in clause 12 in TS 38.331 [2].

 $T_{interrupt} = 532$  ms in the test.  $T_{interrupt}$  is defined in clause 6.1.1.4.2.

This gives a total of 542 ms.

# A.7.3.2 RRC Connection Mobility Control

### A.7.3.2.1 SA: RRC Re-establishment

### A.7.3.2.1.1 Intra-frequency RRC Re-establishment in FR2

### A.7.3.2.1.1.1 Test Purpose and Environment

The purpose is to verify that the NR intra-frequency RRC re-establishment delay in FR2 without known target cell is within the specified limits. These tests will verify the requirements in clause 6.2.1.

The test parameters are given in table A.7.3.2.1.1.1-1, table A.7.3.2.1.1.1-2 and table A.7.3.2.1.1.1-3 below. The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell, becomes inactive. The time period T3 starts after the occurrence of the radio link failure.

Table A.7.3.2.1.1.1-1: Supported test configurations

Config	Description
1	NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode

Table A.7.3.2.1.1.1-2: General test parameters for NR intra-frequency RRC Re-establishment test case in FR2

Parameter		Unit	Test configuration	Value	Comment
Initial	Active cell		1	Cell1	
condition	Neighbour cells		1	Cell2	
Final condition	Active cell		1	Cell2	
RF Chann	el Number		1	1	
Time offse	t between cells		1	3 μs	Synchronous cells
N310		-	1	1	Maximum consecutive out-of-sync indications from lower layers
N311		-	1	1	Minimum consecutive in-sync indications from lower layers
T310	T310		1	0	Radio link failure timer; T310 is disabled
T311		ms	1	5000	RRC re-establishment timer
Access Ba	rring Information	-	1	Not Sent	No additional delays in random access procedure.
SSB config	guration		1	SSB.1 FR2	·
SMTC con	figuration		1	SMTC	
				pattern 1	
DRX cycle	length	S	1	OFF	
PRACH co	PRACH configuration index		1	190	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
T1	T1		1	5	
T2	T2		1	1600	Time for the UE to detect RLF
T3		s	1	3	

Table A.7.3.2.1.1.1-3: Cell specific test parameters for NR intra-frequency RRC Re-establishment test case in FR2

Parameter	Unit	Test	Cell 1			Cell 2		
		configuration	T1	T1 T2 T3		T1	T2	Т3
TDD configuration		1	TDDConf.3.1		TDDConf.3.1			
PDSCH RMC		1	S	R.3.1 TDD	)		N/A	
configuration								
RMSI CORESET		1	C	R.3.1 TDD	)	(	CR.3.1 TDE	)
RMC configuration								
Dedicated CORESET		1	C	CR.3.1 TDI	D	С	CR.3.1 TD	D
RMC configuration								
TRS configuration		1	TI	RS.2.1 TDI	)		N/A	
PDSCH/PDCCH TCI		1	٦	ΓCI.State.2			N/A	
state								
OCNG Pattern		1	OP.1 defined in A.3.2.1			OP.1 defined in A.3.2.1		
Initial DL BWP		1		DLBWP.0.1		DLBWP.0.1		
configuration								
Initial UL BWP		1	ULBWP.0.1		ULBWP.0.1			
configuration								
RLM-RS		1		SSB		SSB		
AoA setup		1	Setup 1	defined in I	<u>4.3.15.1</u>	Setup 1 defined in A.3.15.1		
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	1	-3.07	-infinity	-infinity	-5.07	2	2
$N_{oc}$ Note2	dBm/15 kHz	1	-98					
$N_{oc}$ Note2	dBm/SCS	1	-89					
$\hat{E}_s/N_{oc}$	dB	1	4 -infinity -infinity		2	2	2	
SS-RSRP Note3	dBm/SCS	1	-85 -infinity -infinity -87 -87		-87			
lo	dBm/95.04 MHz	1	-52.94 -55.89 -55.89 -52.94 -55.89 -55.89					
Propagation		1	AWGN					
Condition								

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

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers

and time and shall be modelled as AWGN of appropriate power for  $rac{N_{oc}}{}$  to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

### A.7.3.2.1.1.2 Test Requirements

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to an unknown NR intra frequency cell shall be less than 3 s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

$$T_{re\text{-establish delay}} = T_{UL \text{ grant}} + T_{UE \text{ re-establish delay}}$$
.

Where:

 $T_{UL\_grant}$  = It is the time required to acquire and process uplink grant from the target cell. The PRACH reception at the system simulator is used as a trigger for the completion of the test; hence  $T_{UL\_grant}$  is not used.

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

 $N_{freq} = 1$ 

 $T_{identify intra NR} = 1600 ms$ 

 $T_{SI} = 1280$  ms; it is the time required for receiving all the relevant system information as defined in TS 38.331 for the target intra-frequency NR cell.

T<sub>PRACH</sub> = 15 ms; it is the additional delay caused by the random access procedure.

This gives a total of 2945 ms, allow 3 s in the test case.

### A.7.3.2.1.2 Inter-frequency RRC Re-establishment in FR2

### A.7.3.2.1.2.1 Test Purpose and Environment

The purpose is to verify that the NR inter-frequency RRC re-establishment delay in FR2 without known target cell is within the specified limits. These tests will verify the requirements in clause 6.2.1.

The test parameters are given in table A.7.3.2.1.2.1-1, table A.7.3.2.1.2.1-2 and table A.7.3.2.1.2.1-3 below. The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell, becomes inactive. The time period T3 starts after the occurrence of the radio link failure. During T1, the UE shall be configured with the carrier frequency of cell 2 (with RF Channel Number #2) to ensure that the UE has the context of the carrier frequency of cell 2 by the end of T1.

Table A.7.3.2.1.2.1-1: Supported test configurations

Config	Description
1	NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode

Table A.7.3.2.1.2: General test parameters for NR inter-frequency RRC Re-establishment test case in FR2

Parameter		Unit	Test configuration	Value	Comment
Initial Active cell			1	Cell1	
condition	Neighbour cells		1	Cell2	
Final condition	Active cell		1	Cell2	
RF Channe	el Number		1	1, 2	
Time offse	t between cells		1	3 μs	Synchronous cells
N310		-	1	1	Maximum consecutive out-of-sync indications from lower layers
N311		-	1	1	Minimum consecutive in-sync indications from lower layers
T310		ms	1	0	Radio link failure timer; T310 is disabled
T311		ms	1	5000	RRC re-establishment timer
Access Ba	Access Barring Information		1	Not Sent	No additional delays in random access procedure.
SSB config	guration		1	SSB.1 FR2	
			1	SMTC	
				pattern 1	
DRX cycle	length	S	1	OFF	
PRACH co	PRACH configuration index		1	190	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
T1	T1		1	5	
T2		ms	1	1600	Time for the UE to detect RLF
T3		s	1	6	

Table A.7.3.2.1.2.1-3: Cell specific test parameters for NR inter-frequency RRC Re-establishment test case in FR2

Parameter	Unit	Test	Cell 1			Cell 2		
		configuration	T1 T2 T3			T1	T2	T3
TDD configuration		1	TDDConf.3.1		TDDConf.3.1			
PDSCH RMC		1	S	R.3.1 TDD	)		N/A	
configuration								
RMSI CORESET		1	C	R.3.1 TDD	)		R.3.1 TDE	)
RMC configuration								
Dedicated CORESET		1	C	CR.3.1 TDI	D	C	CR.3.1 TD	D
RMC configuration								
TRS configuration		1		RS.2.1 TDI			N/A	
PDSCH/PDCCH TCI		1	Т	CI.State.2			N/A	
state								
OCNG Pattern		1	OP.1 defined in A.3.2.1			OP.1 defined in A.3.2.1		
Initial DL BWP		1	DLBWP.0.1		DLBWP.0.1			
configuration								
Initial UL BWP		1	ULBWP.0.1		ULBWP.0.1			
configuration								
RLM-RS		1		SSB		SSB		
AoA setup		1		defined in A		Setup 3 defined in A.3.15.3		
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	1	5	-infinity	-infinity	-infinity	-infinity	8
$N_{oc}$ Note2	dBm/15 kHz	1	-98					
$N_{oc}$ Note2	dBm/SCS	1	-89					
$\hat{E_s}/N_{oc}$	dB	1	5 -infinity -infinity		-infinity	-infinity	8	
SS-RSRP Note3	dBm/SCS	1	-84 -infinity -infinity -infinity -infinity		-81			
lo	dBm/95.04 MHz	1	-53.82	-infinity	-infinity	-infinity	-infinity	-51.37
Propagation		1	AWGN					
Condition								

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

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers

and time and shall be modelled as AWGN of appropriate power for  $rac{N_{oc}}{}$  to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

### A.7.3.2.1.2.2 Test Requirements

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to an unknown NR inter frequency cell shall be less than 6 s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

$$T_{re\text{-establish delay}} = T_{UL \text{ grant}} + T_{UE \text{ re-establish delay}}$$
.

Where:

 $T_{UL\_grant}$  = It is the time required to acquire and process uplink grant from the target cell. The PRACH reception at the system simulator is used as a trigger for the completion of the test; hence  $T_{UL\_grant}$  is not used.

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

 $N_{\text{freq}} = 2\,$ 

 $T_{identify\_intra\_NR} = 1600 \text{ ms}$ 

 $T_{identify inter NR} = 2080 \text{ ms}$ 

T<sub>SI</sub> = 1280 ms; it is the time required for receiving all the relevant system information as defined in TS 38.331 for the target inter-frequency NR cell.

T<sub>PRACH</sub> = 15 ms; it is the additional delay caused by the random access procedure.

This gives a total of 5025 ms, allow 6 s in the test case.

### A.7.3.2.1.3 Intra-frequency RRC Re-establishment in FR2 without serving cell timing

### A.7.3.2.1.3.1 Test Purpose and Environment

The purpose is to verify that the NR intra-frequency RRC re-establishment delay in FR2 without serving cell timing is within the specified limits. These tests will verify the requirements in clause 6.2.1.

The test parameters are given in table A.7.3.2.1.3.1-1, table A.7.3.2.1.3.1-2 and table A.7.3.2.1.3.1-3 below. The test consists of 3 successive time periods, with time duration of T1, T2 and T3 respectively. At the start of time period T2, cell 1, which is the active cell, is deactivated. The time period T3 starts after the occurrence of the radio link failure.

Table A.7.3.2.1.3.1-1: Supported test configurations

Configuration	Description					
1	120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode					

Table A.7.3.2.1.3.1-2: General test parameters for NR intra-frequency RRC Re-establishment test case in FR2

Parameter		Unit	Test configuration	Value	Comment
Initial	Active cell		1	Cell1	
condition	Neighbour cells		1	Cell2	
Final condition	Active cell		1	Cell2	
RF Channe	el Number		1	1	
Time offse	t between cells		1	3 μs	Synchronous cells
N310		-	1	1	Maximum consecutive out-of-sync indications from lower layers
N311	N311		1	1	Minimum consecutive in-sync indications from lower layers
T310	T310		1	6000	Radio link failure timer configured by RLF-TimersAndConstants
T311		ms	1	5000	RRC re-establishment timer
Access Ba	rring Information	-	1	Not Sent	No additional delays in random access procedure.
SSB config	uration		1	SSB.1 FR2	1
SMTC con			1	SMTC pattern 1	
DRX cycle	DRX cycle length		1	OFF	
PRACH configuration index			1	190	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
T1	T1		1	5	
T2	T2		1	6	Time for the UE to detect RLF
T3		S	1	5	

Table A.7.3.2.1.3.1-3: Cell specific test parameters for NR intra-frequency RRC Re-establishment test case in FR2

Parameter	Unit	Test	Cell 1		Cell 2				
		configuration	T1 T2 T3		T1	T2	Т3		
TDD configuration		1	T	DDConf.3.	1	Т	TDDConf.3.1		
_		1	S	R.3.1 TDD	)		N/A		
RMSI CORESET		1	C	R.3.1 FDD	)	(	CR.3.1 FDE	)	
RMC configuration									
Dedicated CORESET		1	C	CR.3.1 FDI	D	С	CR.3.1 FD	D	
RMC configuration									
TRS configuration		1	TI	RS.2.1 TDI	)		N/A		
TCI state		1	CS	I-RS.Config	g.0		N/A		
OCNG Pattern		1	OP.1 d	lefined in A	.3.2.1	OP.1 c	defined in A	.3.2.1	
Initial DL BWP		1		LBWP.0.1		[	DLBWP.0.1		
configuration									
Initial UL BWP		1	J	JLBWP.0.1		ULBWP.0.1			
configuration									
RLM-RS		1		SSB		SSB			
AoA setup		1	Setup 1	defined in A	4.3.15.1	Setup 1 defined in A.3.15.1			
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	1	5	-infinity	-infinity	-infinity	-infinity	5	
$N_{oc}$ Note2	dBm/SCS	1	-98						
$N_{oc}$ Note2	dBm/15 kHz	1	-89						
$\hat{E}_s/N_{oc}$	dB	1	5	-infinity	-infinity	-infinity	-infinity	5	
SS-RSRP Note3	dBm/SCS	1	-93	-infinity	-infinity	-infinity	-infinity	-93	
lo	dBm/95.04 MHz	1	-62.82	-infinity	-infinity	-infinity	-infinity	-62.82	
Propagation		1	AWGN						
Condition									

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

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers

and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

### A.7.3.2.1.3.2 Test Requirements

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to an unknown NR intra frequency cell without serving cell timing shall be less than 5 s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

Where:

 $T_{UL\_grant}$  = It is the time required to acquire and process uplink grant from the target cell. The PRACH reception at the system simulator is used as a trigger for the completion of the test; hence  $T_{UL\_grant}$  is not used.

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

 $N_{freq} = 1$ 

 $T_{identify intra NR} = 3520 ms$ 

 $T_{SI} = 1280$  ms; it is the time required for receiving all the relevant system information as defined in TS 38.331 [2] for the target intra-frequency NR cell.

T<sub>PRACH</sub> = 15 ms; it is the additional delay caused by the random access procedure.

This gives a total of 4865 ms, allow 5 s in the test case.

### A.7.3.2.2 Random Access

### A.7.3.2.2.1 Contention based random access test in FR2 for NR Standalone

### A.7.3.2.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will verify the requirements in Clause 6.2.2.2 and Clause 7.1.2 in an AWGN model.

For this test one cell is used, with the configuration of Cell 1 configured as PCell or SCell in FR2. Supported test parameters are shown in Table A.7.3.2.2.1.1-1. UE capble of SA with PCell or SCell in FR2 needs to be tested by using the parameters in Table A.7.3.2.2.1.1-2 and Table A.7.3.2.2.1.1-3.

Table A.7.3.2.2.1.1-1: Supported test configurations for contention based random access test in FR2 for NR Standalone

Config	Description
1	NR PSCell/SCell 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode

Table A.7.3.2.2.1.1-2: General test parameters for contention based random access test in FR2 for **NR Standalone** 

Paramet	ter	Unit	Test-1	Comments
SSB Configuration	Config 1,2		SSB pattern 1 in FR2	As defined in A.3.10,
				except for for number of
				SSBs per SS-burst and
				SS/PBCH block index as
				below
Number of SSBs per SS-	-burst		2	Different from the
				definition in A.3.10
SS/PBCH block index			0,1	Different from the
				definition in A.3.10
Duplex Mode for Cell 2	Config 1,2		TDD	
TDD Configuration	Config 1,2		TDDConf.3.1	
OCNG Pattern Note 1			OCNG pattern 1	As defined in A.3.2.1.
PDSCH parameters Note 2	Config 1,2		SR3.X TDD	As defined in A.3.1.1.
NR RF Channel Number	•		1	
EPRE ratio of PSS to SS	SS	dB		
EPRE ratio of PBCH_DM	MRS to SSS	dB		
EPRE ratio of PBCH to PBCH_DMRS		dB		
EPRE ratio of PDCCH_DMRS to SSS		dB	0	
EPRE ratio of PDCCH to	PDCCH_DMRS	dB		
EPRE ratio of PDSCH_D	MRS to SSS	dB		
EPRE ratio of PDSCH to	PDSCH_DMRS	dB		

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.

Note 2: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.

Table A.7.3.2.2.1.1-3: OTA-related test parameters for contention based random access test in FR2 for NR Standalone

	Parameter	Unit	Test-1	Comments	
AoA setup			Setup 2b	As defined in A.3.15.2.2.	
SSB with index 0	h SSB_RP dB [10] dB larger than SSB_RP for SSB index 1		SSB with index 0 is signalled to be above configured <i>rsrp-ThresholdSSB</i>		
SSB with index 1		dB	Minimum SSB_RP value is dependent on band and power class as specified for spherical coverage AoA in Table B.2.2-2	SSB with index 1 is signalled to be below configured <i>rsrp-ThresholdSSB</i>	
$P_{\mathrm{CMAX,f,c}})$	UE transmitted power (	dBm	maximum value configurable for certain power class	As defined in clause 6.2.4 in TS 38.101-2.	
PRACH Cor	nfiguration		FR2 PRACH configuration 1	As defined in A.3.8.3.	
preambleRe	eceivedTargetPower	dBm	-60		
Propagation	Condition	-	AWGN		
Note 1: N	lo articial noise is applied in tl	nis test.			

Note 2: void.

### A.7.3.2.2.1.2 Test Requirements

Contention based random access is triggered by *not* explicitly assigning a random access preamble via dedicated signalling in the downlink.

### A.7.3.2.2.1.2.1 Random Access Preamble Transmission

To test the UE behavior specified in Clause 6.2.2.2.1.1 the System Simulator shall receive the Random Access Preamble which belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured *rsrp-ThresholdSSB*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -60 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

### A.7.3.2.2.1.2.2 Random Access Response Reception

To test the UE behavior specified in Clause 6.2.2.2.1.2 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response *not* corresponding to the transmitted Random Access Preamble.

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

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

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -60 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

### A.7.3.2.2.1.2.3 No Random Access Response Reception

To test the UE behavior specified in clause 6.2.2.2.1.3 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preambles.

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

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -60 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

### A.7.3.2.2.1.2.4 Receiving an UL grant for msg3 retransmission

To test the UE behavior specified in clause 6.2.2.2.1.4 the System Simulator shall provide an UL grant for msg3 retransmission following a successful Random Access Response.

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

### A.7.3.2.2.1.2.5 Reception of an Incorrect Message over Temporary C-RNTI

To test the UE behavior specified in Clause 6.2.2.2.1.5 the System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element *not* matching the CCCH SDU transmitted in msg3 uplink message.

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

### A.7.3.2.2.1.2.6 Reception of a Correct Message over Temporary C-RNTI

To test the UE behavior specified in Clause 6.2.2.2.1.5 the System Simulator shall send a message addressed to the temporary C-RNTI with a UE Contention Resolution Identity included in the MAC control element matching the CCCH SDU transmitted in the msg3 uplink message.

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

### A.7.3.2.2.1.2.7 Contention Resolution Timer expiry

To test the UE behavior specified in Clause 6.2.2.2.1.6 the System Simulator shall *not* send a response to a msg3.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS 38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if the Contention Resolution Timer expires.

### A.7.3.2.2.2 Non-contention based random access test in FR2 for NR Standalone

### A.7.3.2.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will verify the requirements in Clause 6.2.2.2 and Clause 7.1.2 in an AWGN model.

For this test one cell is used, with the configuration of Cell 1 configured as PCell or SCell in FR2. Supported test parameters are shown in Table A.7.3.2.2.2.1-1. UE capble of SA with PCell or SCell in FR2 needs to be tested by using the parameters in Table A.7.3.2.2.2.1-2 and Table A.7.3.2.2.2.1-3 for SSB-based non-contention based random access test (Test 1) and CSI-RS-based non-contention based random access test (Test 2).

Table A.7.3.2.2.2.1-1: Supported test configurations for non-contention based random access test in FR2 for NR Standalone

Config	Description					
1	NR PSCell/SCell 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode					

Table A.7.3.2.2.2.1-2: General test parameters for non-contention based random access test in FR2 for NR Standalone

Parameter	Unit	Test-1	Test-2	Comments

Config 1,2 SS-burst		SSB pattern 1 in FR2	SSB pattern 1 in FR2	As defined in A.3.10, except of Number of SSBs per SS-burst and SS/PBCH block index as below Different from the
(		0,1	0,1	definition in A.3.10 Different from the definition in A.3.10
Config 1,2		N/A	CSI-RS.3.1 TDD	As defined in A.3.1.4
Config 1,2		TDD	TDD	
Config 1,2		TDDConf.3.1	TDDConf.3.1	
		OCNG pattern 1	OCNG pattern 1	As defined in A.3.2.1.
Config 1,2		SR3.X TDD	SR3.X TDD	As defined in A.3.1.1.
ber		1	1	
SSS	dB			
DMRS to SSS	dB	1		
to	dB			
EPRE ratio of PDCCH_DMRS to SSS		0	0	
EPRE ratio of PDCCH to PDCCH_DMRS			U	
EPRE ratio of PDSCH_DMRS to SSS				
H to	dB			
	SS-burst Config 1,2 Config 1,2 Config 1,2 Config 1,2 ber SSS DMRS to SSS to H_DMRS to H_DMRS to	SS-burst  C Config 1,2  Config 1,2  Config 1,2  Config 1,2  ber SSS	SS-burst 2  Config 1,2 N/A  Config 1,2 TDD  Config 1,2 TDDConf.3.1  Config 1,2 TDDConf.3.1  Config 1,2 SR3.X TDD  ber SSS dB  DMRS to SSS dB  to dB  H_DMRS to dB	SS-burst 2 2  CONFIG 1,2 N/A CSI-RS.3.1 TDD  Config 1,2 TDD TDD  Config 1,2 TDDConf.3.1 TDDConf.3.1  Config 1,2 TDDConf.3.1 TDDConf.3.1  Config 1,2 SR3.X TDD SR3.X TDD  ber SSS dB DMRS to SSS dB to dB H_DMRS to dB H_DMRS to dB  H_DMRS to dB  H_DMRS to dB  H_DMRS to dB  H_DMRS to dB  H_DMRS to dB  H_DMRS to dB

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.

Note 2: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.

Table A.7.3.2.2.2.1-3: OTA-related test parameters for non-contention based random access test in FR2 for NR Standalone

Parameter		Unit	Test-1	Test-2	Comments
AoA setup			Setup 2b	Setup 2b	As defined in A.3.15.2.2.
SSB with index 0		dB	[10] dB larger than SSB_RP for SSB index 1	[10] dB larger than SSB_RP for SSB index 1	SSB with index 0 is signalled to be above configured rsrp-ThresholdSSB
SSB with index 1		dB	Minimum SSB_RP value is dependent on band and power class as specified for spherical coverage AoA in Table B.2.2-2	Minimum SSB_RP value is dependent on band and power class as specified for spherical coverage AoA in Table B.2.2-2	SSB with index 1 is signalled to be below configured <i>rsrp-</i> <i>ThresholdSSB</i>
Configured UE transmitted power ( $P_{\rm CMAX,f.c.}$ ) PRACH Configuration		dBm -	maximum value configurable for certain power class FR2 PRACH	maximum value configurable for certain power class FR2 PRACH	As defined in clause 6.2.4 in TS 38.101-2.  As defined in A.3.8.3.
preambleReceivedTargetPow er		dBm	configuration 2	configuration 3	7.6 dollined III 7.0.0.0.
Propagation	Condition o articial noise is an	-	AWGN	AWGN	

Note 2: void.

#### A.7.3.2.2.2.2 **Test Requirements**

Non-Contention based random access is triggered by explicitly assigning a random access preamble via dedicated signalling in the downlink. In the test, the non-contention based random access procedure is not initialized for Other SI requested from UE or beam failure recovery.

#### A.7.3.2.2.2.2.1 SSB-based Random Access Preamble Transmission

In Test-1, to test the UE behavior specified in Clause 6.2.2.2.2.1 for SSB-based Random Access Preamble tranmsision, with the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs configured, the System Simulator shall receive the Random Access Preamble which has the Preamble Index associated with the SSB with index 0.

In addition, the System Simulator shall receive the Random Access Preamble on the PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0, and the selected PRACH occasion shall belongs to the PRACH occassions permitted by the restrictions given by the ra-ssb-OccasionMaskIndex.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -60 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.7.3.2.2.2.2.2 CSI-RS-based Random Access Preamble Transmission

In Test-1, to test the UE behavior specified in Clause 6.2.2.2.2.1 for CSI-RS-based Random Access Preamble tranmsision, with the contention-free Random Access Resources and the contention-free PRACH occasions associated with CSI-RSs configured, the System Simulator shall receive the Random Access Preamble which has the Preamble Index associated with the CSI-RS configured.

In addition, the System Simulator shall receive the Random Access Preamble on the PRACH occasion which belongs to the PRACH occasions corresponding to the CSI-RS configured, and the selected PRACH occasion shall belongs to the PRACH occasions permitted by the restrictions given by the *ra-OccasionList*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -60 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

### A.7.3.2.2.2.3 Random Access Response Reception

To test the UE behavior specified in Clause 6.2.2.2.2 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response *not* corresponding to the transmitted Random Access Preamble.

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

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

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -60 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

### A.7.3.2.2.2.4 No Random Access Response Reception

To test the UE behavior specified in clause 6.2.2.2.2.3 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preambles.

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

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -60 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

### A.7.3.2.3 SA: RRC Connection Release with Redirection

### A.7.3.2.3.1 Redirection from NR in FR2 to NR in FR2

### A.7.3.2.3.1.1 Test Purpose and Environment

This test is to verify RRC connection release with redirection from NR to NR requirements specified in clause 6.2.3.2.1.

### A.7.3.2.3.1.2 Test Parameters

Supported test configurations are shown in table A.7.3.2.3.1.2-1. The time delay is tested by using the parameters in table A.7.3.2.3.1.2-2, and A.7.3.2.3.1.2-3.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. The *RRCRelease* message containing the relevant system information of Cell 2 shall be sent to the UE during period T1 and the start of T2 is the instant when the last TTI containing the RRC message is sent to the UE. Prior to time duration T2, the UE shall not have any timing information of Cell 2. Cell 2 is powered up at the beginning of the T2.

Table A.7.3.2.3.1.2-1: Redirection from NR to NR test configurations

Config	Description
1	Source cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
	Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode

Table A.7.3.2.3.1.2-2: General test parameters for Redirection from NR to NR test case

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
Filter coefficient	Filter coefficient		0	L3 filtering is not used
Access Barring In	formation	-	Not Sent	No additional delays in random
				access procedure.
Time offset between cells			3 μs	Synchronous cells
T1		S	5	
T2		S	3	

Table A.7.3.2.3.1.2-3: Cell specific test parameters for Redirection from NR to NR test case

Parameter	Unit	Ce	II 1	Cell 2	
Faranietei	Onit	T1	T2	T1	T2
NR RF Channel Number		1			2
Duplex mode			TE	)D	
TDD configuration			TDDC	onf.3.1	
BW <sub>channel</sub>	MHz		100: N <sub>F</sub>	<sub>RB,c</sub> = 66	
BWP BW	MHz		100: N <sub>R</sub>	$_{RB,c} = 66$	
DRx Cycle	ms	Not Applicable			
PDSCH Reference measurement channel			SR3.1	I TDD	
CORESET Reference Channel			CR3.1	I TDD	
OCNG Patterns			OCNG p	attern 1	
SMTC configuration			SMTC	.1 FR2	
PDSCH/PDCCH subcarrier spacing	kHz		120	kHz	
PUCCH/PUSCH subcarrier spacing	kHz 120 kHz		120 kHz		
PRACH configuration		FR2 PRACH configuration 1			
TRS configuration		TRS.2.1 TDD			•
TCI configuration			CSI-RS.	Config.0	

BWP confi	BWP configuration Initial DL BWP				DLBV	/P.0.1		
		Dedicated DL BWP			DLBV	/P.1.1		
		Initial UL BWP		ULBWP.0.1				
	Dedicated UL BWP				ULBV	/P.1.1		
EPRE ratio	of PSS to	SSS						
EPRE ratio	of PBCH [	OMRS to SSS						
EPRE ratio	of PBCH to	o PBCH DMRS						
EPRE ratio	of PDCCH	DMRS to SSS						
EPRE ratio	of PDCCH	to PDCCH DMRS	dB	(	0	(	1	
EPRE ratio	of PDSCH	DMRS to SSS	uБ	,	J	0		
EPRE ratio	of PDSCH	to PDSCH						
EPRE ratio	of OCNG I	DMRS to SSS(Note 1)						
	of OCNG	to OCNG DMRS (Note						
1)	1)							
$N_{oc}$ Note2	Note2		dBm/15kH	-104.7		-104.7		
1 v oc	•		Z					
$N_{oc}$ Note2	Config 1,2	2	dBm/SCS	-95.7		-95.7		
TV <sub>oc</sub> Noice	Config 3		dbiii/3C3	-95.7		-95.7		
$\hat{E}_{s}/I_{ot}$			dB	5	5	-Infinity	5	
$\hat{E}_s/N_{oc}$	$\hat{E}_s/N_{oc}$		dB	5	5	-Infinity	5	
Io <sup>Note3</sup>	Config 1,2	2	dBm/ BW	-60.5	-60.5	-66.7	-60.5	
	Config 3		dBm/ BW	-60.5	-60.5	-66.7	-60.5	
Propagation	n condition	·	-		AW	'GN		
Note 1:	Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral						wer spectral	

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

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

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

Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone

Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone

### A.7.3.2.3.1.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 1880 ms from the beginning of time period T2.

The rate of correct RRC connection release redirection to NR observed during repeated tests shall be at least 90%.

NOTE: The redirection delay can be expressed as:

 $T_{connection\_release\_redirect\_NR} = T_{RRC\_procedure\_delay} + T_{identify\_NR} + T_{SI\_NR} + T_{RACH},$ 

where:

 $T_{RRC procedure delay} = 110 \text{ ms}$  and is specified in clause 12 in TS 38.331 [2].

 $T_{identify-NR} = 1760$  ms in the test.

 $T_{\text{SI-NR}} = 0$  ms is assumed, since the UE is provided with the SI (including MIB and all relevant SIBs) of the target NR cell before the RRC connection is released by the old NR cell.

 $T_{RACH} = 10$  ms in the test.

This gives a total of 1880 ms.

# A.7.4 Timing

# A.7.4.1 UE transmit timing

### A.7.4.1.1 NR UE Transmit Timing Test for FR2

### A.7.4.1.1.1 Test Purpose and environment

The purpose of this test is to verify that the UE can follow frame timing change of the connected gNodeb and that the UE initial transmit timing accuracy, maximum amount of timing change in one adjustment, minimum and maximum adjustment rate are within the specified limits. This test will verify the requirements in clause 7.1.2.

Supported test configurations are shown in Table 7.4.1.1.1-1.

Table A.7.4.1.1.1-1: Supported test configurations for FR2 PCell

Configuration	Description
1	NR TDD, SSB SCS 240 kHz, data SCS 120 kHz, BW 100 MHz

For this test a single NR cell is used. Tables A.7.4.1.1.1-2 and A.7.4.1.1.1-2A define the parameters to be configured and strength of the transmitted signals. The transmit timing is verified by the UE transmitting SRS using the configuration defined in Table A.7.4.1.1.1-3.

Table A.7.4.1.1.1-2: Cell Specific Test Parameters for UL Transmit Timing test

Parameter	Unit	Config	Test1	Test2
SSB ARFCN		1	Freq1	Freq1
TDD configuration		1	TDDConf.1.2	
BWchannel	MHz	1	100: N <sub>RB,c</sub> = 66	
Initial BWP Configuration		1	DLBWP.0.1 ULBWP.0.1	
Dedicated BWP Configuration		1	DLBWP.1.1 ULBWP.1.1	
TRS Configuration		1	TRS.2.1 TDD	
TCI State		1	CSI-RS.Config.0	
DRx Cycle	ms	1	N/A	DRX.5 <sup>Note5</sup>
PDSCH Reference measurement channel		1	SR.3.1 TDD	
RMSI CORESET Reference Channel		1	CR.3.1 TDD	
Dedicated CORESET Reference Channel		1	CCR.3.1 TDD	
OCNG Patterns		1	OP.1	

SSB Configuration		1	SSB.2 FR2	
SMTC Configuration		1	SMTC.1	
EPRE ratio of PSS to SSS				
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS	dB	1	0	0
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS(Note 1)				
EPRE ratio of OCNG to OCNG DMRS (Note 1)				
Propagation condition		1	AWGN	
SRS Config		1	SRSConf.1 <sup>Note6</sup>	SRSConf.2 <sup>Note6</sup>

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.
- Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 5: DRx related parameters are given in Table A.3.3.5-1
- Note 6: SRS configs are given in Table A.7.4.1.1.1-3

Table A.7.4.1.1.1-2A: OTA related test parameters

Parameter	Unit	Test 1	Test 2	
Angle of arrival configuration		According to clause A.3.15.1		
N <sub>oc</sub> Note1	dBm/15kHz <sup>Note4</sup>	-112		
$N_{oc}^{\text{Note1}}$	dBm/SCS <sup>Note3</sup>	-1	03	
$\hat{E}_s/N_{oc}$	dB		4	
SS-RSRP <sup>Note2</sup>	dBm/SCS Note4	-(	99	
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB		4	
Io <sup>Note2</sup>	dBm/95.04 MHz Note4	-6	8.5	
	ther cells and noise sources not specified in the test is assumed to be arriers and time and shall be modelled as AWGN of appropriate power d.			
	vels have been derived from other parameters for information			

purposes. They are not settable parameters themselves.

Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone Note 4:

As observed with 0dBi gain antenna at the centre of the quiet zone Note 5:

Table A.7.4.1.1.3: SRS Configuration for Timing Accuracy Test

	Field	SRSConf.1	SRSConf.2	Comments
SRS-ResourceSet	srs-ResourceSetId	0	0	
	srs-ResourceldList	0	0	
	resourceType	Periodic	Periodic	
	Usage	Codebook	Codebook	
SRS-Resource	SRS-Resourceld	0	0	
	nrofSRS-Ports	Port1	Port1	
	transmissionComb	n2	n2	
	combOffset-n2	0	0	
	cyclicShift-n2	0	0	
	resourceMapping startPosition	0	0	
	resourceMapping nrofSymbols	n1	n1	
	resourceMapping repetitionFactor	n1	n1	
	freqDomainPosition	0	0	
	freqDomainShift	0	0	
	freqHopping c-SRS	17	17	Matches N <sub>RB,c</sub>
	freqHopping b-SRS	0	0	
	freqHopping b-hop	0	0	
	groupOrSequenceHopping	Neither	Neither	
	resourceType	Periodic	Periodic	
	periodicityAndOffset-p	sl1, 0	sl2560, 0	Offset to align with DRx periodicity
	sequenceld	0	0	Any 10 bit number

### Table A.7.4.1.1.1-4: Void

### A.7.4.1.1.2 Test requirements

The test sequence shall be carried out in RRC\_CONNECTED for every test case.

Following will be the test sequence for this test:

- 1) Setup NR PCell according to parameters given in Table A.7.4.1.1.1-1.
- 2) After connection set up with the cell, the test equipment will verify that the timing of the NR cell is within  $(N_{TA} + N_{TA~offset}) \times T_c \pm T_e$  of the first detected path of DL SSB.
  - a. The  $N_{TA}$  offset value (in  $T_c$  units) is 13792
  - b. The  $T_e$  values depend on the DL and UL SCS for which the test is being run and are given in Table 7.1.2-1
- 3) The test system shall adjust the timing of the DL path by values given in Table A.7.4.1.1.2-1

Table A.7.4.1.1.2-1 Adjustment Value for DL Timing

SCS of SSB signals (kHz)	Adjustment Value		
	Test1	Test2	
240	+8*64T <sub>c</sub>	+4*64T <sub>c</sub>	

- 4) The test system shall verify that the adjustment step size and the adjustment rate shall be according to requirements specified in clause 7.1.2 Table 7.1.2-3 until the UE transmit timing offset is within ( $N_{TA} + N_{TA\_offset}$ ) ×T<sub>c</sub> ± T<sub>e</sub> respective to the first detected path (in time) of DL SSB. Skip this step for test 2 with DRX confiured.
- 5) The test system shall verify that the UE transmit timing offset stays within  $(N_{TA} + N_{TA\_offset}) \times T_c \pm T_e$  of the first detected path of DL SSB. For Test 2 the UE transmit timing offset shall be verified for the first transmission in the DRX cycle immediately after DL timing adjustment.

# A.7.4.2 UE timer accuracy

## A.7.4.3 Timing advance

## A.7.4.3.1 SA FR2 timing advance adjustment accuracy

### A.7.4.3.1.1 Test Purpose and Environment

The purpose of the test is to verify UE Timing Advance adjustment delay and accuracy requirement defined in clause 7.3.

### A.7.4.3.1.2 Test Parameters

Supported test configurations are shown in table A.7.4.3.1.2-1. Both timing advance adjustment delay and accuracy are tested by using the parameters in table A.7.4.3.1.2-2, A.7.4.3.1.2-3 and A.7.4.3.1.2-4.

In all test cases, single cell is used. Each test consists of two successive time periods, with time duration of T1 and T2 respectively. In each time period, timing advance commands are sent to the UE and Sounding Reference Signals (SRS), as specified in table A.7.4.3.1.2-3, are sent from the UE and received by the test equipment. By measuring the reception of the SRS, the transmit timing, and hence the timing advance adjustment accuracy, can be measured.

During time period T1, the test equipment shall send one message with a Timing Advance Command MAC Control Element, as specified in clause 6.1.3.4 in TS 38.321 [7]. The Timing Advance Command value shall be set to 31, which according to clause 4.2 in TS 38.213 [3] results in zero adjustment of the Timing Advance. In this way, a reference value for the timing advance used by the UE is established.

During time period T2, the test equipment shall send a sequence of messages with Timing Advance Command MAC Control Elements, with Timing Advance Command value specified in table A.7.4.3.1.2-2. This value shall result in changes of the timing advance used by the UE, and the accuracy of the change shall then be measured, using the SRS sent from the UE.

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

The UE Time Alignment Timer, described in Clause 5.2 in TS 38.321 [7], shall be configured so that it does not expire in the duration of the test.

Table A.7.4.3.1.2-1: Timing advance supported test configurations

Config	Description	
1	NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode	

Table A.7.4.3.1.2-2: General test parameters for timing advance

Parameter	Unit	Value	Comment
RF channel number		1	
Initial DL BWP		DLBWP.0.1	As specified in Table A.3.9.2.1-1
Dedicated DL BWP		DLBWP.1.1	As specified in Table A.3.9.2.2-1
Initial UL BWP		ULBWP.0.1	As specified in Table A.3.9.3.1-1
Dedicated UL BWP		ULBWP.1.1	As specified in Table A.3.9.3.2-1
Timing Advance Command $(T_A)$ value during T1		31	N <sub>TA_new</sub> = N <sub>TA_old</sub> for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2
Timing Advance Command (T <sub>A</sub> ) value during T2		39	For $120 \text{ kHz SCS N}_{TA\_new} = N_{TA\_old} + 1024*T_c$ (based on equation in clause 4.2 of TS 38.213 [3])
T1	S	5	
T2	s	5	

Table A.7.4.3.1.2-3: Cell specific test parameters for timing advance

Parameter	Unit	Test1		
Faranietei	Unit	T1	T2	

Duplex mode		TDD			
TDD configuration		TDDConf.3.1			
BW <sub>channel</sub>	MHz	100: $N_{RB,c} = 66$			
BWP BW	MHz	$100: N_{RB,c} = 66$			
DRx Cycle	ms	Not Applicable			
PDSCH Reference measurement channel		SR.3.1 TDD			
CORESET Reference Channel		CR.3.1 TDD			
OCNG Patterns		OCNG pattern 1			
TRS configuration		TRS.2.1 TDD			
TCI configuration		CSI-RS.Config.0			
SMTC configuration		SMTC.1 FR2			
PDSCH/PDCCH subcarrier spacing	kHz	120 kHz			
PUCCH/PUSCH subcarrier spacing	kHz	120 kHz			
EPRE ratio of PSS to SSS					
EPRE ratio of PBCH DMRS to SSS					
EPRE ratio of PBCH to PBCH DMRS					
EPRE ratio of PDCCH DMRS to SSS					
EPRE ratio of PDCCH to PDCCH DMRS	dB	0			
EPRE ratio of PDSCH DMRS to SSS	uБ	Ů			
EPRE ratio of PDSCH to PDSCH					
EPRE ratio of OCNG DMRS to SSS(Note 1)					
EPRE ratio of OCNG to OCNG DMRS (Note					
1)					
Propagation condition	-	AWGN			
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral					
density is achieved for all OFDM symbols.					
Note 2: Interference from other cells and no	ise sources no	ot specified in the test is assumed to be constant over			

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

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

Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone

Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone

Table A.7.4.3.1.2-3A: OTA related test parameters

	Parameter	Unit	Test 1	
			T1	T2
Angle of	arrival configuration		According to clause A.3.15.1	
$N_{oc}$ Note1		dBm/15kHz <sup>Note4</sup>	-112	
$N_{oc}$ Note1	ı	dBm/SCS <sup>Note3</sup>	-	103
$\hat{E}_s/N_{oc}$		dB		4
SS-RSRI	ONote2	dBm/SCS Note4		-99
$\hat{E}_{s}/I_{ot}$		dB		4
Io <sup>Note2</sup>		dBm/95.04 MHz <sup>Note4</sup>	-	68.5
Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate pow for $N_{ac}$ to be fulfilled.				
Note 2: Note 3:	SS-RSRP and lo lev purposes. They are r SS-RSRP minimum	els have been derived from on not settable parameters them requirements are specified as	selves.	
	noise at each receive	er antenna port.	D: : (1)	

Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone

Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone

Table A.7.4.3.1.2-4: Sounding Reference Symbol Configuration for timing advance

Field	Value	Comment
c-SRS	16	For many on home in a discalated
b-SRS	0	Frequency hopping is disabled
b-hop	0	
freqDomainPosition	0	Frequency domain position of SRS
freqDomainShift	0	
groupOrSequenceHopping	neither	No group or sequence hopping
SRS-PeriodicityAndOffset	sl5=0	Once every 5 slots
pathlossReferenceRS	ssb-Index=0	SSB #0 is used for SRS path loss estimation
usage	Codebook	Codebook based UL transmission
startPosition	0	resourceMapping setting. SRS on last
nrofSymbols	n1	symbol of slot, and 1symbols for SRS
repetitionFactor	n1	without repetition.
combOffset-n2	0	transmissionComb setting
cyclicShift-n2	0	transmissionComb setting
nrofSRS-Ports	port1	Number of antenna ports used for SRS transmission
Note: For further information see clar	use 6.3.2 in TS 38	.331 [2].

### A.7.4.3.1.3 Test Requirements

The UE shall apply the signalled Timing Advance value to the transmission timing at the designated activation time i.e. k+1 slots after the reception of the timing advance command, where k = 11.

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

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

# A.7.5 Signaling characteristics

# A.7.5.1 Radio link Monitoring

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

Editor note: The metric for the detection of the UE UL transmitted signal by the TE is FFS.

# A.7.5.1.1 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode

### A.7.5.1.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell. This test will partly verify the FR2 radio link monitoring requirements in clause 8.1.

Supported test configurations are shown in table A.7.5.1.1.1-1. The test parameters are given in Tables A.7.5.1.1.1-2, A.7.5.1.1.1-3, and A.7.5.1.1.1-4 below. There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.7.5.1.1.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. The UE is configured to perform inter-frequency measurements using Gap Pattern ID #0 (40ms) in test 1.

Table A.7.5.1.1.1-1: Supported test configurations for FR2 PCell

Configuration	Description
1	TDD, SSB SCS 120 KHz, data SCS 120KHz, BW 100 MHz

Table A.7.5.1.1.1-2: General test parameters for FR2 out-of-sync testing in non-DRX mode

	Parameter		Unit	Value
				Test 1
Active PCell				Cell 1
RF Channel Nui	mber			1
Duplex mode		Config 1		TDD
BWchannel		Config 1		100: N <sub>RB,c</sub> = 66
DL initial BWP of		Config 1		DLBWP.0.1
	NP configuration	Config 1		DLBWP.1.1
UL initial BWP of		Config 1		ULBWP.0.1
	NP configuration	Config 1		ULBWP.1.1
TDD Configurat		Config 1		TDDConf.3.1
CORESET Refe		Config 1		CR.3.1 TDD
SSB Configurati		Config 1		SSB.1 FR2
SMTC Configura		Config 1		SMTC.1
PDSCH/PDCCH	ł subcarrier	Config 1		120 KHz
spacing				
PRACH Configu		Config 1		Table A.3.8.3.4
	ned as RLM RS	Config 1		0,1
OCNG paramet	ers			OP.2
CP length				Normal
	rix and Antenna Co	nfiguration		2x2 Low
Out of sync	DCI format			1-0
transmission		rol OFDM symbols		2
parameters	Aggregation lev		CCE	8
		etical PDCCH RE	dB	4
	energy to avera	ge SSS RE energy		
		etical PDCCH DMRS	dB	4
		ge SSS RE energy		
	DMRS precode			REG bundle size
	REG bundle siz	e		6
DRX				OFF
Gap pattern ID				gp0
Layer 3 filtering				Enabled
T310 timer			ms	0
T311 timer			ms	1000
N310			1110	1
N311				<u> </u>
CSI-RS for CSI	reporting	Config 1		CSI-RS.3.1 TDD
TCI states for P		i comig i		TCI.State.2
CSI-RS for track		Config 1		TRS.2.1 TDD
T1	a	i comig i	s	0.2
T2			s	9.68
T3			S	9.68
D1			S	9.64
	nfigurations are as	signed to the UE prior to		

Note 2: UE-specific PDCCH is not transmitted after T1 starts.

Table A.7.5.1.1.1-3: OTA related cell specific test parameters for FR2 (Cell 1) for out-of-sync radio link monitoring tests in non-DRX mode

Parameter		Unit		Test 1	
			T1	T2	Т3
setup			Setup	3 defined in A	A.3.15
RE ratio of PDCCH DMRS to SS		dB	4		
RE ratio of PDCCH to PDCCH DI	IRS	dB		0	
RE ratio of PBCH DMRS to SSS		dB			
RE ratio of PBCH to PBCH DMR		dB			
RE ratio of PSS to SSS		dB			
RE ratio of PDSCH DMRS to SS		dB	0		
RE ratio of PDSCH to PDSCH DI	RS	dB			
RE ratio of OCNG DMRS to SSS		dB			
RE ratio of OCNG to OCNG DMF	S	dB			
Index 0 SNR Config 1		dB	2	-6	-15
Index 1 SNR Config 1			2	-15	-15
R on other channels Config 1		dB		2	
signals				2	
Config 1	dl	Bm/15	•	02 1dBm	
2		KHz		-92. IUDIII	
pagation condition			TI	DL-A 30ns 75l	Hz
RE ratio of OCNG DMRS to SSS RE ratio of OCNG to OCNG DMR Index 0 SNR	S di	dB dB dB dB MB M/15 KHz		-15 2 -92.1dBm DL-A 30ns 75l	-

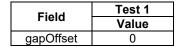
Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.

Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.

Note 4: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6.

Table A.7.5.1.1.1-4: Measurement gap configuration for out-of-sync tests in non-DRX mode



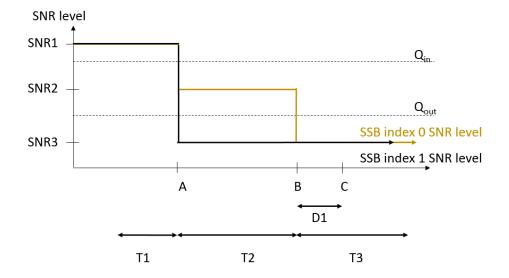


Figure A.7.5.1.1.1-1: SNR variation for out-of-sync testing

### A.7.5.1.1.2 Test Requirements

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

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

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

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

# A.7.5.1.2 Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode

### A.7.5.1.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell. This test will partly verify the FR2 radio link monitoring requirements in clause 8.1.

Supported test configurations are shown in table A.7.5.1.2.1-1. The test parameters are given in Tables A.7.5.1.2.1-2, and A.7.5.1.2.1-3 below. There is one cell (Cell 1), which is the active cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.7.5.1.2.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. Prior to the start of the time duration T1, the UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms.

Table A.7.5.1.2.1-1: Supported test configurations for FR2 PCell

Configuration	Description
1	TDD, SSB SCS 120 KHz, data SCS 120KHz, BW 100 MHz

Table A.7.5.1.2.1-2: General test parameters for FR2 in-sync testing in non-DRX mode

Parameter			Unit	Value
				Test 1
Active PCell				Call 1
RF Channel No	ımhor			Cell 1
Duplex mode	annei	Config 1		TDD
BW <sub>channel</sub>		Config 1		100: N <sub>RB,c</sub> = 66
DL initial BWP	configuration	Config 1		DLBWP.0.1
DL dedicated E		Config 1		DLBWP.1.1
configuration				
UL initial BWP	configuration	Config 1		ULBWP.0.1
UL dedicated E	BWP	Config 1		ULBWP.1.1
configuration				
TDD Configura		Config 1		TDDConf.3.1
CORESET Ref	erence	Config 1		CR.3.1 TDD
Channel	4:	0		000 4 500
SSB Configura		Config 1		SSB.1 FR2
SMTC Configu PDSCH/PDCC		Config 1 Config 1		SMTC.3 120 KHz
spacing	n subcarrier	Corning 1		120 KHZ
PRACH Config	uration	Config 1		Table A.3.8.3.4
SSB index ass		Config 1		0,1
RS	ignou do rizin	John St.		3,1
OCNG parame	ters			OP.2
CP length				Normal
Correlation Ma	trix and Antenna	Configuration		2x2 Low
In sync	DCI format			1-0
transmission		ntrol OFDM symbols		2
parameters	Aggregation le	vel	CCE	4
		netical PDCCH RE	dB	0
		age SSS RE energy		
	Ratio of hypoth		dB	0
	energy	to average SSS RE		
	DMRS precode	er granularity		REG bundle size
	REG bundle si	7e		6
Out of sync	DCI format			1-0
transmission		ntrol OFDM symbols		2
parameters	Aggregation le		CCE	8
		netical PDCCH RE	dB	4
		age SSS RE energy		
		netical PDCCH	dB	4
	•	to average SSS RE		
	energy			REG bundle size
	DMRS precode	er granularity		REG buridle size
	REG bundle si	ze		6
DRX				OFF
Gap pattern ID				N.A.
Layer 3 filtering				Enabled
T310 timer		ms	4000	
T311 timer			ms	1000
N310				1
N311				<u>.</u> 1
CSI-RS for CS	I reporting	Config 1		CSI-RS.3.1 TDD
	PDCCH/PDSCH			TCI.State.2
CSI-RS for trac		Config 1		TRS.2.1 TDD
T1			S	0.2
T2			S	0.2

T3		S	1.88		
T4		S	0.2		
T5		S	3.84		
D1		S	3.8		
Note 1:	Note 1: All configurations are assigned to the UE prior to the start of time period T1.				
Note 2:					

Table A.7.5.1.2.1-3: OTA related cell specific test parameters for FR2 (Cell 1) for in-sync radio link monitoring tests in non-DRX mode

	Paran	neter	Unit			Test 1		
				T1	T2	T3	T4	T5
AoA setu	ıp				Setup 3	defined	in A.3.1	5
EPRE ra	tio of PDCCH	DMRS to SSS	dB			4		
EPRE ra	tio of PDCCH	to PDCCH DMRS	dB			0		
EPRE ra	tio of PBCH D	MRS to SSS	dB					
EPRE ra	tio of PBCH to	PBCH DMRS	dB					
EPRE ra	tio of PSS to	SSS	dB					
EPRE ra	tio of PDSCH	DMRS to SSS	dB			0		
EPRE ra	tio of PDSCH	to PDSCH DMRS	dB					
EPRE ra	tio of OCNG [	DMRS to SSS	dB					
EPRE ratio of OCNG to OCNG DMRS			dB					
ssb-Inde	x 0 SNR	Config 1	dB	2	-6	-15	-4.5	2
ssb-Inde	x 1 SNR	Config 1		2	-15	-15	-15	-15
SNR on	other	Config 1	dB			2		
channels	and signals							
$N_{oc}$		Config 1	dBm/1		(	92.1dBn	n	
			5KHz				•	
Propagat	tion condition					A 30ns		
Note 1:		I be used such that the						
		al transmitted power s	spectral de	ensity is	achieve	ed for al		
	symbols.							
Note 2:	<ol><li>The signal contains PDCCH for UEs other than the device under test as part of OCNG.</li></ol>							
Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.								
Note 4: The SNR values are specified for testing a UE which supports 2RX on at lea								
	one band. F	or testing of a UE whi	ich suppoi	rts 4RX	on all b	ands, th	ne SNR	during
	T3 is A.3.6.							

Table A.7.5.1.2.1-4: Void

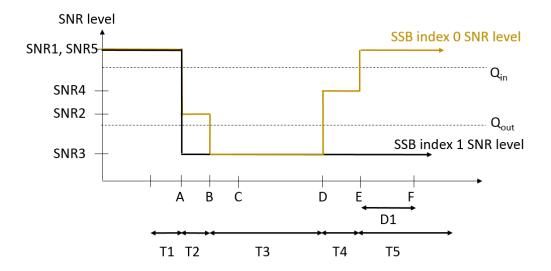


Figure A.7.5.1.2.1-1: SNR variation for in-sync testing

#### A.7.5.1.2.2 Test Requirements

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

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

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

# A.7.5.1.3 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode

#### A.7.5.1.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell when DRX is used. This test will partly verify the FR2 radio link monitoring requirements in clause 8.1.

Supported test configurations are shown in table A.7.5.1.3.1-1. The test parameters are given in Tables A.7.5.1.3.1-2, and A.7.5.1.3.1-3. There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.7.5.1.3.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

Table A.7.5.1.3.1-1: Supported test configurations for FR2 PCell

Configuration	Description				
1	TDD, SSB SCS 120 KHz, data SCS 120KHz, BW 100 MHz				

Table A.7.5.1.3.1-2: General test parameters for FR2 out-of-sync testing in DRX mode

Parameter			Unit	Value	
				Test 1	
Active PCell				Cell 1	
RF Channel Nu	ımber			1	
Duplex mode		Config 1		TDD	
BW <sub>channel</sub>		Config 1		100: N <sub>RB,c</sub> = 66	
DL initial BWP		Config 1		DLBWP.0.1	
DL dedicated B	SWP	Config 1		DLBWP.1.1	
configuration					
UL initial BWP		Config 1		ULBWP.0.1	
UL dedicated B	BWP	Config 1		ULBWP.1.1	
configuration					
TDD Configura		Config 1		TDDConf.3.1	
CORESET Ref	erence	Config 1		CR.3.1 TDD	
Channel					
SSB Configuration		Config 1		SSB.1 FR2	
SMTC Configur		Config 1		SMTC.1	
PDSCH/PDCC	H subcarrier	Config 1		120 KHz	
spacing					
PRACH Config		Config 1		Table A.3.8.3.4	
SSB index assi	gned as RLM	Config 1		0,1	
	RS				
	OCNG parameters			OP.1	
CP length				Normal	
	trix and Antenna	Configuration		2x2 Low	
Out of sync	DCI format			1-0	
transmission		ntrol OFDM symbols		2	
parameters	Aggregation le		CCE	8	
		hetical PDCCH RE	dB	4	
		age SSS RE energy			
		hetical PDCCH	dB	4	
		to average SSS RE			
	energy				
	DMRS precod			REG bundle size	
22/10 5	REG bundle s	IZE		6	
DRX Configura	tion			DRX.3	
Gap pattern ID				N.A.	
Layer 3 filtering				Enabled	
T310 timer			ms	0	
T311 timer			ms	1000	
N310				1	
N311		10 5 4		1	
CSI-RS for CSI		Config 1		CSI-RS.3.1 TDD	
	TCI states for PDCCH/PDSCH			TCI.State.2	
CSI-RS for tracking Config 1				TRS.2.1 TDD	
T1			S	0.2	
T2			S	14.48	
T3			S	14.48	
D1			S	14.44	
		e assigned to the UE p		tart of time period T1.	
Note 2: UE-specific PDCCH is not transmitted after T1 starts.					

Table A.7.5.1.3.1-3: OTA related cell specific test parameters for FR2 (Cell 1) for out-of-sync radio link monitoring tests in DRX mode

Paramet	er	Unit		Test 1		
			T1 T2 T3			
AoA setup			Setu	Setup 1 defined in A.3.15		
EPRE ratio of PDCCH DM	IRS to SSS	dB		4		
EPRE ratio of PDCCH to F	PDCCH DMRS	dB		0		
EPRE ratio of PBCH DMR	S to SSS	dB				
EPRE ratio of PBCH to PE	CH DMRS	dB				
EPRE ratio of PSS to SSS	}	dB				
EPRE ratio of PDSCH DM	RS to SSS	dB		0		
EPRE ratio of PDSCH to F	PDSCH DMRS	dB				
EPRE ratio of OCNG DMF	RS to SSS	dB				
EPRE ratio of OCNG to O	CNG DMRS	dB				
ssb-Index 0 SNR	Config 1	dB	2	-6	-15	
ssb-Index 1 SNR	Config 1		2	-15	-15	
SNR on other channels	dB		2			
and signals						
$N_{oc}$ Config 1		dBm/15K		-104.7dBm		
	Hz					
Propagation condition			-	TDL-A 30ns 75H:	Z	

Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

The signal contains PDCCH for UEs other than the device under test as part of OCNG. Note 2:

SNR levels correspond to the signal to noise ratio over the SSS REs. Note 3:

Note 4: The SNR values are specified for testing a UE which supports 2RX on at least one band. For

testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6.

Table A.7.5.1.3.1-4: Void Table A.7.5.1.3.1-5: Void

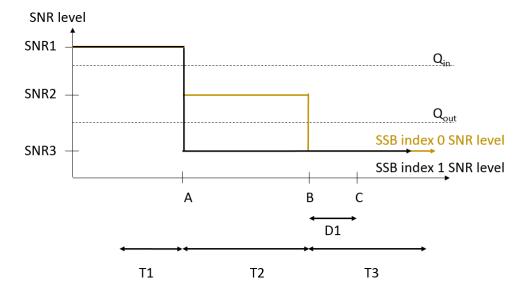


Figure A.7.5.1.3.1-1: SNR variation for out-of-sync testing

### A.7.5.1.3.2 Test Requirements

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

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

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

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

# A.7.5.1.4 Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode

### A.7.5.1.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell when DRX is used. This test will partly verify the FR2 radio link monitoring requirements in clause 8.1.

Supported test configurations are shown in table A.7.5.1.4.1-1. The test parameters are given in Tables A.7.5.1.4.1-2, and A.7.5.1.4.1-3. There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.7.5.1.4.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when Onduration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

Editor note: AoA setting needs to be updated.

Table A.7.5.1.4.1-1: Supported test configurations for FR2 PCell

Configuration	Description
1	TDD, SSB SCS 120 KHz, data SCS 120KHz, BW 100 MHz

Table A.7.5.1.4.1-2: General test parameters for FR2 in-sync testing in DRX mode

Parameter			Unit	Value
				Test 1
Active PCell				Cell 1
RF Channel Nu	umber			1
Duplex mode		Config 1		TDD
BW <sub>channel</sub>	fiti	Config 1		100: N <sub>RB,c</sub> = 66
DL initial BWP DL dedicated E	configuration	Config 1 Config 1		DLBWP.0.1 DLBWP.1.1
configuration	DVVE	Coning i		DLBWF.1.1
UL initial BWP	configuration	Config 1		ULBWP.0.1
UL dedicated E		Config 1		ULBWP.1.1
configuration				
TDD Configura	tion	Config 1		TDDConf.3.1
CORESET Ref	erence	Config 1		CR.3.1 TDD
Channel				
SSB Configura		Config 1		SSB.1 FR2
SMTC Configu		Config 1		SMTC.3
PDSCH/PDCC	H subcarrier	Config 1		120 KHz
spacing	uration	Config 1		Toblo A 2 9 2 4
PRACH Config SSB index ass		Config 1 Config 1		Table A.3.8.3.4 0,1
RS	igned as KLIVI	Coning i		0,1
OCNG parame	ters			OP.1
CP length	1010			Normal
	trix and Antenna	Configuration		2x2 Low
In sync	DCI format	- 5		1-0
transmission	Number of Cor	ntrol OFDM symbols		2
parameters	Aggregation le	vel	CCE	4
		netical PDCCH RE	dB	0
		age SSS RE energy		
	Ratio of hypoth		dB	0
		to average SSS RE		
	energy DMRS precode	ar granularity		REG bundle size
	REG bundle si			6
Out of sync	DCI format			1-0
transmission		ntrol OFDM symbols		2
parameters	Aggregation le		CCE	8
	Ratio of hypoth	netical PDCCH RE	dB	4
		age SSS RE energy		
	Ratio of hypoth		dB	4
		to average SSS RE		
	energy	or granularity		DEC hundle size
	DMRS precode REG bundle si			REG bundle size 6
DRX Configura		<u> </u>		DRX.11
Gap pattern ID				N.A.
Layer 3 filtering				Enabled
T310 timer			ms	4000
T311 timer		ms	1000	
N310			1	
N311			1	
CSI-RS for CSI reporting Config 1			CSI-RS.3.1 TDD	
TCI states for PDCCH/PDSCH				TCI.State.2
CSI-RS for trac	king	Config 1		TRS.2.1 TDD
T1			S	0.2
T2			S	0.2
T3 T4			S	2.8 0.2
T5			s s	3.88
15			3	5.00

D1		S	3.84
Note 1: All configurations are assigned to the UE pr		rior to the st	art of time period T1.
Note 2: UE-specific PDCCH is not transmitted after T1 starts.			

Table A.7.5.1.4.1-3: OTA related cell specific test parameters for FR2 (Cell 1) for in-sync radio link monitoring test in DRX mode

Paı	ameter	Unit			Test 1		
			T1	T2	T3	T4	T5
AoA setup				Setup 1	defined	in A.3.1	15
EPRE ratio of PDCCI	I DMRS to SSS	dB			4		
EPRE ratio of PDCCI	to PDCCH DMRS	dB			0		
EPRE ratio of PBCH	DMRS to SSS	dB					
EPRE ratio of PBCH	to PBCH DMRS	dB					
EPRE ratio of PSS to	SSS	dB					
EPRE ratio of PDSCH	I DMRS to SSS	dB			0		
EPRE ratio of PDSCH	dB						
<b>EPRE</b> ratio of OCNG	DMRS to SSS	dB					
EPRE ratio of OCNG	to OCNG DMRS	dB					
ssb-Index 0 SNR	Config 1	dB	2	-6	-15	-4.5	2
ssb-Index 1 SNR	Config 1		2	-15	-15	-15	-15
SNR on other	Config 1	dB			2		
channels and signals							
$N_{oc}$ Config 1		dBm/1			104.7dE	2m	
1 V oc	5KHz			104.7 UL	)		
Propagation condition			TDL	-A 30ns	75Hz		
Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a							
constant to	tal transmitted power sp	ectral density	/ is achi	eved for	all OFD	OM symb	ools.
Note O. The signal contains DDCCII for LIFe other than the device condented as next of							

- Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.3
- Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.
- Note 4: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6.

Table A.7.5.1.4.1-4: Void Table A.7.5.1.4.1-5: Void

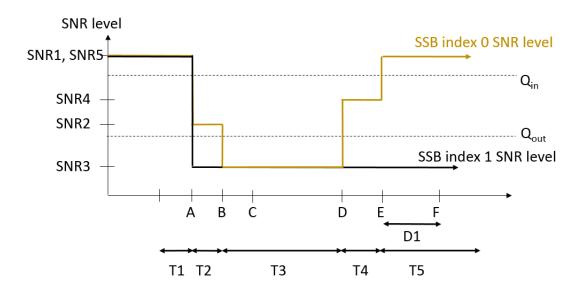


Figure A.7.5.1.4.1-1: SNR variation for in-sync testing

#### A.7.5.1.4.2 Test Requirements

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

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

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

# A.7.5.1.5 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with CSI-RS-based RLM in non-DRX mode

#### A.7.5.1.5.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when no DRX is used. This test will partly verify the FR2 PCell CSI-RS Out-of-sync radio link monitoring requirements in clause 8.1.

The test parameters are given in Tables A.7.5.1.5.1-1, A.7.5.1.5.1-2, A.7.5.1.5.1-3 and A.7.5.1.5.1-4 below. There is one cell, cell 1 which is the PCell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.7.5.1.5.1-1 shows the variation of the downlink SNR in the PCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 10 ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test. In the test, SSB0 and SSB1 are configured as BFD-RS.

Table A.7.5.1.5.1-1: Supported test configurations for FR2 PCell

Configuration	Description			
1	TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth			

Table A.7.5.1.5.1-2: General test parameters for FR2 PCell for CSI-RS out-of-sync testing in non-DRX mode

	Parameter	Unit	Value
			Test 1
Active PCell			Cell 1
RF Channel Number			1
Duplex mode	Config 1		TDD
TDD Configuration	Config 1		TDDConf.3.1
DL initial BWP	Config 1		DLBWP.0.1
configuration			
DL dedicated BWP	Config 1		DLBWP.1.1
configuration	-		
UL initial BWP	Config 1		ULBWP.0.1
configuration	-		
UL dedicated BWP	Config 1		ULBWP.1.1
configuration			
CORESET	Config 1		CCR.3.1 TDD
Reference Channel	-		CCR.3.3 TDD
SSB Configuration	Config 1		SSB.1 FR2
SMTC Configuration	Config 1		SMTC.1
PDSCH/PDCCH	Config 1		120 KHz
subcarrier spacing	3		
CSI-RS for RLM	Config 1		Resource #4 in TRS.2.1 TDD
	- Same		Resource #4 in TRS.2.2 TDD
TRS configuration			TRS.2.1 TDD
gaaa			TRS.2.2 TDD
TCI configuration for P	DCCH#1/PDSCH		TCI.State.2
TCI configuration for P			TCI.State.3
OCNG parameters	BOOT III 2		OP.1
CP length			Normal
	Antenna Configuration		2x2 Low
	<u> </u>		
Out of sync	DCI format		1-0
transmission	Number of Control OFDM		2
parameters	symbols		
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE	dB	4
	energy to average CSI-RS RE		
	energy		
	Ratio of hypothetical PDCCH	dB	4
	DMRS energy to average CSI-RS		
	RE energy		
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			OFF
Gap pattern ID			*gp0
Layer 3 filtering			Enabled
T310 timer		ms	0
T311 timer		ms	1000
N310			1
N311			1
CSI-RS for CSI	Config 1		CSI-RS.3.1 TDD
reporting			
T1		s	0.2
T2		S	0.35
T3		S	0.35
D1		S	0.31
	PDCCH is not transmitted after T1 sta		3.01
140to 1. OL-Specific	1 DOOT TO HOL HANSIIIIIIIOU AILOI 11 SI	., .G.	

Table A.7.5.1.5.1-3: Cell specific test parameters for FR2 for CSI-RS out-of-sync radio link monitoring in non-DRX mode

Parameter		Unit	Test 1			
			T1	T2	T3	
PDCCH beta		dB		4		
PDCCH_DMR	S_beta	dB		4		
PBCH_beta		dB				
PSS_beta		dB				
SSS_beta		dB		0		
PDSCH_beta		dB				
OCNG beta		dB				
SNR on RLM-RS1	Config 1	dB	2	-6	-15	
SNR on RLM-RS2	Config 1	dB	2	-14	-15	
SNR on other channels and signals	Config 1	dB	2			
$N_{oc}$	Config 1	dBm/15KHz	TBD			
Propagation condition		TDL-C 300ns 100Hz				
NI 1 1 00N						

- Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
- Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
- Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
- Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
- Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.7.5.1.5.1-1.
- Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6.

Table A.7.5.1.5.1-4: Measurement gap configuration for FR2 CSI-RS out-of-sync radio link monitoring in non-DRX mode

	Field	Test 1			
	Field				
	gapOffset	0			
Note 1:	RLM RS is partially overlapped with				
	measurement gap				

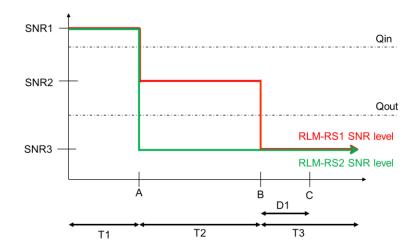


Figure A.7.5.1.5.1-1: SNR variation for CSI-RS out-of-sync testing

#### A.7.5.1.5.2 Test Requirements

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

During time durations T1, T2 and T3, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

The UE shall stop transmitting uplink signal in Cell 1 no later than time point C ( $D_1$  second after the start of the time duration T3) on the PCell.

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

# A.7.5.1.6 Radio Link Monitoring In-sync Test for FR2 PCell configured with CSI-RS-based RLM in non-DRX mode

#### A.7.5.1.6.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the in sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when no DRX is used. This test will partly verify the FR2 PCell CSI-RS In-sync radio link monitoring requirements in clause 8.1.

The test parameters are given in Tables A.7.5.1.6.1-1, A.7.5.1.6.1-2 and A.7.5.1.6.1-3 below. There is one cells, cell 1which is the PCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.7.5.1.6.1-1 shows the variation of the downlink SNR in the PCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 10 ms. In the test, DRX configuration is not enabled. In the test, SSB0 and SSB1 are configured as BFD-RS.

Table A.7.5.1.6.1-1: Supported test configurations for FR2 PCell

Configuration	Description	
1	TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth	

Table A.7.5.1.6.1-2: General test parameters for FR2 PCell for CSI-RS in-sync testing in non-DRX mode

	Parameter	Unit	Value
			Test 1
Active PCell			Cell 1
RF Channel Number			1
Duplex mode	Config 1		TDD
TDD Configuration	Config 1		TDDConf.3.1
DL initial BWP	Config 1		DLBWP.0.1
configuration			
DL dedicated BWP	Config 1		DLBWP.1.1
configuration			
UL initial BWP	Config 1		ULBWP.0.1
configuration			
UL dedicated BWP	Config 1		ULBWP.1.1
configuration	0.5.4		000 0 4 TDD
CORESET	Config 1		CCR.3.1 TDD
Reference Channel	One for A		CCR.3.3 TDD
SSB Configuration	Config 1		SSB.1 FR2
SMTC Configuration	Config 1		SMTC.1
PDSCH/PDCCH	Config 1		120 KHz
subcarrier spacing	0 5 4		D
CSI-RS for RLM	Config 1		Resource #4 in TRS.2.1 TDD Resource #4 in TRS.2.2 TDD
TRS configuration	1		TRS.2.1 TDD
3			TRS.2.2 TDD
TCI configuration for P	DCCH#1/PDSCH		TCI.State.2
TCI configuration for P			TCI.State.3
OCNG parameters			OP.1
CP length			Normal
	Antenna Configuration		2x2 Low
	DCI format		1-0
0.4.5	Number of Control OFDM		2
Out of sync	symbols	225	
transmission	Aggregation level	CCE	8
parameters	Ratio of hypothetical PDCCH RE	dB	4
	energy to average CSI-RS RE		
	energy Ratio of hypothetical PDCCH	dB	4
	DMRS energy to average CSI-RS	uБ	4
	RE energy		
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
In sync transmission	DCI format		1-0
parameters	Number of Control OFDM		2
paramotoro	symbols		_
	Aggregation level	CCE	4
	Ratio of hypothetical PDCCH RE	dB	0
	energy to average CSI-RS RE	ub	
	energy		
	Ratio of hypothetical PDCCH	dB	0
	DMRS energy to average CSI-RS		
	RE energy		
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			OFF
Gap pattern ID			N.A.
Layer 3 filtering			Enabled
T310 timer		ms	1000
T311 timer		ms	1000
N310			1
L			i .

N311			1
CSI-RS for CSI reporting	Config 1		CSI-RS.3.1 TDD
T1		S	0.2
T2		S	0.2
T3		S	0.24
T4		S	0.2
T5		S	0.88
D1		S	0.84
Note 1: UE-specific PDCCH is not transmitted after T1 starts.			

Table A.7.5.1.6.1-3: Cell specific test parameters for FR2 for CSI-RS in-sync radio link monitoring in non-DRX mode

Parameter		Unit			Test 1		
			T1	T2	T3	T4	T5
PDCCH_beta		dB	4				
PDCCH_DMF	RS_beta	dB			4		
PBCH_beta		dB					
PSS_beta		dB					
SSS_beta		dB	0				
PDSCH beta		dB	]				
OCNG_beta		dB	7				
SNR on	Config 1	dB	2	-6	-15	-4.5	2
RLM-RS1							
SNR on	Config 1	dB	2	-14	-15	-15	-14
RLM-RS1							
SNR on Config 1		dB	2				
RLM-RS1							
$N_{oc}$	Config 1	dBm/15KHz	TBD				
Propagation condition			TDL-C 300ns 100Hz				

- Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
- Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
- Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
- Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
- Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure A.7.5.1.6.1-1.
- Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6.

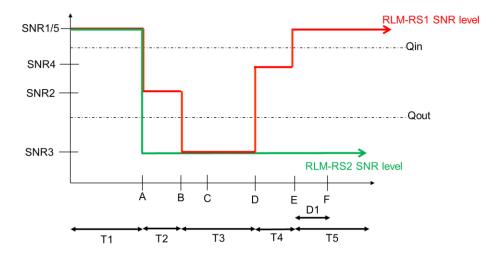


Figure A.7.5.1.6.1-1: SNR variation for CSI-RS in-sync testing

#### A.7.5.1.6.2 Test Requirements

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

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

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

# A.7.5.1.7 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with CSI-RS-based RLM in DRX mode

#### A.7.5.1.7.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when DRX is used. This test will partly verify the FR2 PCell CSI-RS Out-of-sync radio link monitoring requirements in clause 8.1.

The test parameters are given in Tables A.7.5.1.7.1-1, A.7.5.1.7.1-2, and A.7.5.1.7.1-3 below. There is one cell, cell 1 is the PCell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.7.5.1.7.1-1 shows the variation of the downlink SNR in the PCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 10 ms. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test. In the test, SSB0 and SSB1 are configured as BFD-RS.

Table A.7.5.1.7.1-1: Supported test configurations for FR2 PCell

Configuration	Description	
1	TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth	

Table A.7.5.1.7.1-2: General test parameters for FR2 PCell for CSI-RS out-of-sync testing in DRX mode

	Parameter	Unit	Value
			Test 1
Active PCell			Cell 1
RF Channel Number			1
Duplex mode	Config 1		TDD
TDD Configuration	Config 1		TDDConf.3.1
DL initial BWP configuration	Config 1		DLBWP.0.1
DL dedicated BWP configuration	Config 1		DLBWP.1.1
UL initial BWP	Config 1		ULBWP.0.1
configuration	Cornig		OLBVVF.U.1
UL dedicated BWP	Config 1		ULBWP.1.1
configuration	Comig		OLDWI .I.I
CORESET	Config 1		CCR.3.1 TDD
Reference Channel	Comig		CCR.3.3 TDD
SSB Configuration	Config 1		SSB.1 FR2
SMTC Configuration	Config 1		SMTC.1
PDSCH/PDCCH	Config 1		120 KHz
subcarrier spacing	Coming 1		IZU NIIZ
CSI-RS for RLM	Config 1		Resource #4 in TRS.2.1 TDD
COI-ING IOI INLIVI	Comig		Resource #4 in TRS.2.2 TDD
TRS configuration	L		TRS.2.1 TDD
110 comiguration			TRS.2.2 TDD
TCI configuration for P	DCCH#1/PDSCH		TCI.State.2
TCI configuration for P			TCI.State.3
OCNG parameters	BOOT III Z		OP.1
CP length			Normal
	Antenna Configuration		2x2 Low
Out of sync	DCI format		1-0
transmission	Number of Control OFDM		2
parameters	symbols		_
'	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE	dB	4
	energy Ratio of hypothetical PDCCH	dB	4
	DMRS energy to average CSI-RS RE energy	uБ	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			DRX.3
Gap pattern ID			N.A.
Layer 3 filtering			Enabled
T310 timer		ms	0
T311 timer		ms	1000
N310			1
N311			1
CSI-RS for CSI	Config 1		CSI-RS.3.1 TDD
reporting			
T1		S	0.2
T2		s	1.28
T3		s	1.28
D1		s	1.24
Note 1: UE-specific	PDCCH is not transmitted after T1 sta	arts.	

Table A.7.5.1.7.1-3: Cell specific test parameters for FR2 for CSI-RS out-of-sync radio link monitoring in DRX mode

Parameter		Unit	Test 1			
			T1	T2	Т3	
PDCCH_beta		dB		4		
PDCCH_DMRS	S_beta	dB	4			
PBCH_beta		dB				
PSS_beta		dB				
SSS_beta		dB		0		
PDSCH_beta		dB				
OCNG_beta	OCNG beta					
SNR on RLM-RS1	Config 1	dB	2	-6	-15	
SNR on RLM-RS2	Config 1	dB	2	-14	-15	
SNR on other channels and signals	Config 1	dB	2			
$N_{oc}$	Config 1	dBm/15KHz	-104.7			
Propagation condition			TDL-C 300ns 100Hz			

- Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
- Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
- Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
- Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
- Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.7.5.1.7.1-1.
- Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is [A.3.6].

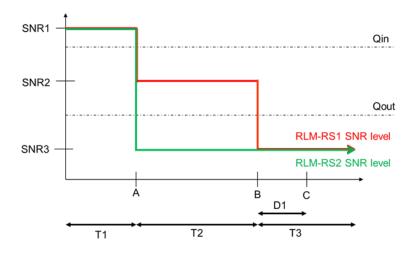


Figure A.7.5.1.7.1-1: SNR variation for CSI-RS out-of-sync testing

# A.7.5.1.7.2 Test Requirements

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

During time durations T1, T2 and T3, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on PCell.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 (PCell) at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

The UE shall stop transmitting uplink signal in Cell 1 (PCell) no later than time point C ( $D_1$  secondafter the start of the time duration T3) on the PCell.

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

# A.7.5.1.8 Radio Link Monitoring In-sync Test for FR2 PCell configured with CSI-RS-based RLM in DRX mode

# A.7.5.1.8.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the in sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when DRX is used. This test will partly verify the FR2 PCell CSI-RS In-sync radio link monitoring requirements in clause 8.1.

The test parameters are given in Tables A.7.5.1.8.1-1, A.7.5.1.8.1-2, A.7.5.1.8.1-3 and A.7.5.1.8.1-4 below. There is one cells, cell 1which is the PCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.7.5.1.8.1-1 shows the variation of the downlink SNR in the PCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 10 ms. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test. In the test, SSB0 and SSB1 are configured as BFD-RS.

Table A.7.5.1.8.1-1: Supported test configurations for FR2 PSCell

Configuration	Description	
1	TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth	

Table A.7.5.1.8.1-2: General test parameters for FR2 PCell for CSI-RS in-sync testing in non-DRX mode

	Parameter	Unit	Value
			Test 1
Active PCell			Cell 1
RF Channel Number			1
Duplex mode	Config 1		TDD
TDD Configuration	Config 1		TDDConf.3.1
DL initial BWP	Config 1		DLBWP.0.1
configuration			
DL dedicated BWP	Config 1		DLBWP.1.1
configuration	0 5 4		LII DIMD 0.4
UL initial BWP	Config 1		ULBWP.0.1
configuration UL dedicated BWP	Confin 4		ULBWP.1.1
configuration	Config 1		ULBVVP.1.1
CORESET	Config 1		CCR.3.1 TDD
Reference Channel	Comig		CCR.3.1 TDD
SSB Configuration	Config 1		SSB.1 FR2
SMTC Configuration	Config 1		SMTC.1
PDSCH/PDCCH	Config 1		120 KHz
subcarrier spacing	Comig		120 1(1)2
CSI-RS for RLM	Config 1		Resource #4 in TRS.2.1 TDD
OOI IKO IOI IKEM	Coming 1		Resource #4 in TRS.2.2 TDD
TRS configuration			TRS.2.1 TDD
ga.aa			TRS.2.2 TDD
TCI configuration for P	PDCCH#1/PDSCH		TCI.State.2
TCI configuration for P			TCI.State.3
OCNG parameters			OP.1
CP length			Normal
	Antenna Configuration		2x2 Low
	<u> </u>		
Out of sync	DCI format		1-0
transmission	Number of Control OFDM		2
parameters	symbols	005	
	Aggregation level Ratio of hypothetical PDCCH RE	CCE dB	8 4
	energy to average CSI-RS RE	uБ	4
	energy		
	Ratio of hypothetical PDCCH	dB	4
	DMRS energy to average CSI-RS	GD.	Ţ
	RE energy		
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
In sync transmission	DCI format		1-0
parameters	Number of Control OFDM		2
	symbols		
	Aggregation level	CCE	4
	Ratio of hypothetical PDCCH RE	dB	0
	energy to average CSI-RS RE		
	energy		
	Ratio of hypothetical PDCCH	dB	0
	DMRS energy to average CSI-RS		
	RE energy		DEOL " :
	DMRS precoder granularity		REG bundle size
DDV	REG bundle size		6
DRX Can nettern ID			DRX.3
Gap pattern ID			*gp0
Layer 3 filtering		ma	Enabled
T310 timer		ms	2000
T311 timer N310		ms	1000
INOTO			1

N311			1
CSI-RS for CSI reporting	Config 1		CSI-RS.3.1 TDD
T1		S	0.2
T2		S	0.2
T3		S	1.64
T4		S	0.2
T5		S	1.88
D1		S	1.84
Note 1: UE-specific PDCCH is not transmitted after T1 starts.			

Table A.7.5.1.8.1-3: Cell specific test parameters for FR2 for CSI-RS in-sync radio link monitoring in non-DRX mode

Parameter		Unit			Test 1		
			T1	T2	T3	T4	T5
PDCCH_beta	a	dB	4				
PDCCH_DM	RS_beta	dB	4				
PBCH_beta		dB					
PSS_beta		dB					
SSS_beta		dB	0				
PDSCH_beta	3	dB					
OCNG beta		dB	7				
SNR on	Config 1	dB	2	-6	-15	-4.5	2
RLM-RS1							
SNR on	Config 1	dB	2	-14	-15	-15	-14
RLM-RS1							
SNR on	Config 1	dB	2				
RLM-RS1							
$N_{oc}$	Config 1	dBm/15KHz			-104.7		
Propagation condition			TDL-C 300ns 100Hz				

- Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
- Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.
- Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
- Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
- Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure A.7.5.1.8.1-1.
- Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6.

Table A.7.5.1.8.1-4: Measurement gap configuration for FR2 CSI-RS in-sync radio link monitoring in non-DRX mode

	Field				
	rieia				
	0				
Note 1:	Note 1: RLM RS is partially overla				
	measurement gap				

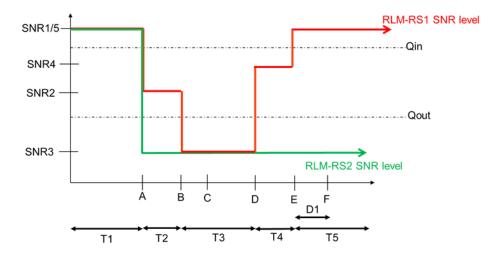


Figure A.7.5.1.8.1-1: SNR variation for CSI-RS in-sync testing

## A.7.5.1.8.2 Test Requirements

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

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

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

### A.7.5.1.9 UE Radio Link Monitoring Scheduling Restrictions on FR2

#### A.7.5.1.9.1 Test Purpose and Environment

The purpose is to verify that the NR UE correctly follows the RLM scheduling restrictions requirements defined in clause 8.1.7. This test verifies that the UE correctly receive the PDCCH scheduled on the symbols right before the RLM SSB symbols without overlap so that it sends ACK/NACK correctly. The test case is only applicable to UE which supports pdcch-MonitoringAnyOccasions or pdcch-MonitoringAnyOccasionsWithSpanGap.

The test parameters are given in table A.7.5.1.9.1-1, table A.7.5.1.9.1-2 and table A.7.5.1.9.1-3 below. The UE is required during time period T1 to transmit ACK/NACK correctly upon scheduling of PDSCH.

Table A.7.5.1.9.1-1: Supported test configurations

Configuration	Description		
1	120 kHz SSB SCS, 120 kHz RMC SCS, 100 MHz bandwidth, TDD duplex mode		

Table A.7.5.1.9.1-2: General test parameters for NR RLM scheduling restriction test case in FR2

Parameter	Unit	Test configuration	Value	Comment
RF Channel Number		1	1	
SSB configuration		1	SSB.1 FR2	
SMTC configuration		1	SMTC	
			pattern 1	
DRX cycle length	S	1	OFF	
T1	S	1	5	During T1 the UE is required to correctly
				transmit ACK/NACK

Table A.7.5.1.9.1-3: Cell specific test parameters for NR RLM scheduling restriction test case in FR2

Parameter	Unit	Test	Cell 1	
		configuration	AoA1	AoA2
TDD configuration		1	TDDC	onf.3.1
PDSCH RMC		1	SR.3.1 TDD	Not sent
configuration				
RMSI CORESET		1	CR.3.1 TDD	Not sent
RMC configuration				
Dedicated CORESET		1	CCR.3.2 TDD	Not sent
RMC configuration				
TRS configuration		1	TRS.2.1 TDD	TRS.2.2 TDD
PDCCH/PDSCH TCI		1	TCI.State.2	N/A
state				
OCNG Pattern		1	OP.1 defined in	Not sent
			A.3.2.1	
Initial DL BWP		1	DLBV	VP.0.1
configuration				
Initial UL BWP		1	ULBV	VP.0.1
configuration				
RLM-RS		1	SSB with index 0	SSB with index 1
AoA setup		1		ed in A.3.15.3
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	1	3	N/A
$L_{\rm s}/L_{\rm ot}$				
$N_{oc}$ Note2	dBm/SCS	1	-84.9	Not sent
$\hat{E}_s/N_{oc}$	dB	1	3	N/A
SS-RSRP Note3	dBm/SCS	1	-81.9	-81.9
lo	dBm/95.04 MHz	1	-51.15	-52.91
Propagation		1	AW	/GN
Condition				

# A.7.5.1.9.2 Test Requirements

The UE behaviour follows the requirements defined in clause 8.1.7.3.

# A.7.5.2 Interruption

# A.7.5.2.1 Interruptions during measurements on deactivated NR SCC in FR2

# A.7.5.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE missed ACK/NACK rate does not exceed the limits at NR PSCell interruptions during the measurement on the deactivated NR SCC. This test will verify the missed ACK/NACK rate for PCell in standalone NR specified in clause 8.2.2.2. Supported test configurations are shown in table A.7.5.2.1.1-1.

The general test parameters and NR cell specific test parameters are given in Table A.7.5.2.1.1-2 and A.7.5.2.1.1-3 below. In the test there are two cells: Cell1 and Cell2. Cell1 is PCell, Cell2 is an NR deactivated SCell. Cell1 shall be configured as PCell and Cell2 shall be configured as SCell.

The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE is connected to Cell1 and Cell2. The point in time at which the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated NR SCells is received at the UE antenna connector, defines the start of time period T1. During T1, PCell is continuously scheduled in DL.

Table A.7.5.2.1.1-1: Interruptions during measurements on deactivated NR SCC supported test configurations

Config	Description		
1	NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD – TDD duplex mode		

Table A.7.5.2.1.1-2: General test parameters for interruptions during measurements on deactivated NR SCC in standalone NR

Parameter	Unit	Value	Comment
RF Channel Number		1, 2	Two NR RF channels
Active PCell		Cell1	PCell on NR RF channel number 1.
Configured deactivated		Cell2	Deactivated SCell on NR RF channel
SCell			number 2.
CP length		Normal	Applicable to Cell1 and Cell2
DRX		OFF	
Measurement gap pattern Id		OFF	
SCell measurement cycle (measCycleSCell)	ms	640	
T1	S	10	

Table A.7.5.2.1.1-3: NR cell specific test parameters for interruptions during measurements on deactivated NR SCC in standalone NR

Parameter		Unit	Cell1	Cell2
Frequency Range			F	R2
Duplex mode			TDD	
TDD configuration			TDDConf.3.1	
BW <sub>channel</sub>			100 MHz: N <sub>RB,c</sub> = 66	
Initial DL BWP			DLBWF	P.0.2 <sup>Note4</sup>
Configuration				
Initial UL BWP			ULBWF	P.0.2 Note6
Configuration				
Downlink dedicated			DLBV	VP.1.1
BWP Configuration				
Uplink dedicated			ULBV	VP.1.1
BWP configuration				
PDSCH Reference			SR.3.	1 TDD
measurement				
channel				
RMSI CORESET			CR.3.	1 TDD
parameters				
Dedicated			CCR.3	3.1 TDD
CORESET				
parameters				
OCNG Patterns				P.1
SMTC Configuration				TC.1
SSB Configuration				1 FR2
TCI State				State.0
TRS Configuration				.1 TDD
Correlation Matrix and A	Antenna		1x2	Low
Configuration				
EPRE ratio of PSS to SSS EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to	PBCH			
DMRS EPRE ratio of PDCCH [	DMDC to			
	DIVIRS 10			
SSS	to DDCCH			
EPRE ratio of PDCCH to PDCCH DMRS		dB	0	0
EPRE ratio of PDSCH DMRS to		u D		U
SSS				
	EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG D				
SSS(Note 1)				
EPRE ratio of OCNG to OCNG				
DMRS (Note 1)				
Time offset to Cell1 Note	3	μS	-	3
Propagation Condition		μο	Δ\Λ	/GN
1 Topagation Condition				

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

Note 2: Void

Note 3: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.

Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2 defined in clause 12 of of TS 38.213 [3].

Table A.7.5.2.1.1-4: OTA related test parameters for interruptions during measurements on deactivated NR SCC in standalone NR

Par	ameter	Unit	Cell 1	Cell 2
Angle of arrival con	iguration		Setup1 according to table A.3.15.1	Setup 1according to table A.3.15.1
$N_{oc}^{}$ Note1	NR_TDD_FR2_A NR_TDD_FR2_B NR_TDD_FR2_F NR_TDD_FR2_G NR_TDD_FR2_T	dBm/15kHz	-112	-112
	NR_TDD_FR2_Y	1		
$N_{oc}$ Note1	NR_TDD_FR2_A NR_TDD_FR2_B NR_TDD_FR2_F NR_TDD_FR2_G NR_TDD_FR2_T NR_TDD_FR2_Y	- dBm/SCS	-102.97	-102.97
SS-RSRP <sup>Note2</sup>	NR TDD FR2 A NR TDD FR2 B NR TDD FR2 F NR TDD FR2 G NR TDD FR2 T NR TDD FR2 Y	dBm/120KH z <sup>Note3</sup>	-85.97	-85.97
$\hat{E}_s/N_{oc}$		dB	17	17
$\hat{E}_{s}/I_{ot}$	•	dB	17	17
Io <sup>Note2</sup>	NR_TDD_FR2_A NR_TDD_FR2_B NR_TDD_FR2_F NR_TDD_FR2_G NR_TDD_FR2_T NR_TDD_FR2_Y	dBm/95.04 MHz <sup>Note4</sup>	-56.90	-56.90
	nce from other cells and over subcarriers and time			
for $N_{oc}$	to be fulfilled.			
Note 2: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: SS-RSRP minimum requirements are specified assuming independent interference and poise at each receiver antenna port				

noise at each receiver antenna port.

Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone

As observed with 0 dBi gain antenna at the centre of the quiet zone Note 5:

#### A.7.5.2.1.2 **Test Requirements**

The UE shall be continuously scheduled on PCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on PCell. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption on PCell shall not exceed the value defined in Table A.7.5.2.1.2-1 if the PCell is not in the same band as the deactivated SCell or Table A.7.5.2.1.2-2 if the PCell is in the same band as the deactivated SCell.

Table A.7.5.2.1.2-1: Interruption duration if the PCell is not in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length (slot)
3	0.125	4

Table A.7.5.2.1.2-2: Interruption duration if the PCell is in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length (slot)
3	0.125	4 + SMTC duration

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

# A.7.5.3 SCell Activation and Deactivation Delay

### A.7.5.3.1 SCell Activation and deactivation for SCell in FR2 intra-band in non-DRX

# A.7.5.3.1.1 Test Purpose and Environment

The purpose of this test case is the same as for the test defined in clause A.6.5.3.1.1 except the PCell and SCell are in FR2 intra-band.

The supported test configurations are shown in table A.7.5.3.1.1-1 below. The general test parameters are the same as defined in Table A.6.5.3.1.1-2 except those described in Tables A.7.5.3.1.1-2, and cell specific test parameters are described in Tables A.7.5.3.1.1-3. OTA related test parameters are shown in table A.7.5.3.1.1-4 below.

Table A.7.5.3.1.1-1: Supported test configurations for FR2 SCell activation case

Configuration	Description
1	NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode

Table A.7.5.3.1.1-2: General test parameters for FR2 SCell activation case

Parameter	Unit	Value	Comment
RF Channel Number		4	One NR radio channel is used for this test,
		I	cell 1 and cell2 use the same RF channel.

Table A.7.5.3.1.1-3: Cell specific test parameters for FR2 SCell activation case

Parameter <sup>Note 5</sup>	Unit	T1	1	Т	2	Т	3
Parameter	Unit	Cell 1	Cell 2	Cell 1	Cell 2	Cell 1	Cell 2

	I	_		_		-		
SSB ARFCN			:q2		:q2		:q2	
Duplex mode			DD		DD		DD	
TDD configuration		TDDC	onf.3.1	TDDC	onf.3.1	TDDC	onf.3.1	
Downlink initial BWP Configuration		DLBV	VP.0.1	DLBW	VP.0.1	DLBV	WP.0.1	
Downlink dedicated BWP Configuration		DLBWP.1.1 DLBWP.1.1 DLBWP			√P.1.1			
Uplink initial BWP configuration		ULBV	ULBWP.0.1 ULBWP.0.1 ULBWF			√P.0.1		
Uplink dedicated BWP configuration		ULBV	VP.1.1	ULBW	VP.1.1	ULBV	√P.1.1	
TRS configuration			.1 TDD	TRS.2.	.1 TDD		.1 TDD	
TCI state		TCI.S	state.0	TCI.S	tate.0	TCI.S	tate.0	
BW <sub>channel</sub>	MHz	100: N <sub>F</sub>	$_{RB,c} = 66$	100: N <sub>F</sub>	$_{RB,c} = 66$	100: N <sub>F</sub>	$_{RB,c} = 66$	
PDSCH Reference measurement channel		SR.3.1		SR.3.1		SR.3.1		
PD3CH Reference measurement channel		TDD	-	TDD	-	TDD	-	
RMSI CORESET Parameters		CR.3.1		CR.3.1		CR.3.1		
TAMOI CONLOCT L'alameters		TDD	-	TDD	-	TDD	_	
Dedicated CORESET Parameters		CCR.3.	_	CCR.3.	_	CCR.3.	_	
		1 TDD	_	1 TDD	_	1 TDD	_	
OCNG Patterns				OF				
SSB Configuration				SSB.	1 FR2			
SMTC Configuration				SMT	ΓC.1			
EPRE ratio of PSS to SSS								
EPRE ratio of PBCH_DMRS to SSS								
EPRE ratio of PBCH to PBCH_DMRS								
EPRE ratio of PDCCH_DMRS to SSS								
EPRE ratio of PDCCH to PDCCH_DMRS	dB	0						
EPRE ratio of PDSCH_DMRS to SSS	UD	0						
EPRE ratio of PDSCH to PDSCH_DMRS								
EPRE ratio of OCNG DMRS to SSSNote 1								
EPRE ratio of OCNG to OCNG DMRS Note								
1								
Propagation conditions				AW	/GN			

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

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

Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: All parameters apply for configuration 1 and 2

Table A.7.5.3.1.1-4: OTA related test parameters for FR2 SCell activation case

ParamatarNote 6	Unit	Cell 1			Cell 2		
Farameter	Unit	T1	T2	Т3	T1	T2	Т3

Angle of arrival configuration		Setup 1 according to table A.3.15.1	Setup 1 according to table A.3.15.1
$N_{oc}^{ m Note1}$	dBm/15kHz <sup>N</sup>	-112	-112
$N_{oc}^{ m Note1}$	dBm/SCS <sup>Note</sup>	-102.97	-102.97
$\hat{E}_s/N_{oc}$	dB	14	14
SS-RSRP <sup>Note2</sup>	dBm/SCS Note4	-88.97	-88.97
$\hat{E}_{s}/I_{ot}$	dB	14	14
Io <sup>Note2</sup>	dBm/95.04 MHz <sup>Note4</sup>	-88.80	-88.80

- Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.
- Note 2: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone
- Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone
- Note 6: All parameters apply for configuration 1 and 2

### A.7.5.3.1.2 Test Requirements

The test requirements defined in clause A.6.5.3.1.2 shall apply to this test case, except  $T_{activation\_time}$  will be replaced with the value [ $T_{SMTC\ SCell} + 5ms$ ] as defined in clause 8.3.

# A.7.5.3.2 SCell Activation and deactivation for FR1+FR2 inter-band with target SCell in FR2

#### A.7.5.3.2.1 Test Purpose and Environment

The purpose of this test case is the same as for the test defined in clause A.7.5.3.1.1 except the PCell is in FR1 and SCell is in FR2.

The supported test configurations are the same as defined in Table A.7.5.3.2.1-1. The general test parameters are the same as defined in Table A.6.5.3.1.1-2. And cell specific test parameters are described in Tables A.7.5.3.2.1-2. OTA related test parameters are the same as defined in Table A.7.5.3.2.1-3.

Table A.7.5.3.2.1-1: Supported test configurations for FR2 SCell activation case

Configuration	Description						
1	PCell: 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode						
	Target SCell: 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode						
2	PCell: 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode						
	Target SCell: 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode						
3	PCell: 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode						
	Target SCell: 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode						
Note: The UE is onl	Note: The UE is only required to pass in one of the supported test configurations						

Table A.7.5.3.2.1-2: Cell specific test parameters for FR2 SCell activation case

Not   Config   Conf	B	4Note 5	11!4	Т	1	Т	2	Т	3
Duplex mode		eternotes	Unit	Cell 1	Cell 2	Cell 1	Cell 2	Cell 1	Cell 2
Configuration									
TDD configuration	Duplex mode			FDD	TDD			FDD	TDD
Application   Config 2.3   Application   Config 2.3   Config 3.3   Config 2.3   Config 3.3   Config 2.3   Config 3.3   C									
Downlink initial BWP Configuration   Downlink dedicated BWP Configuration   Downlink BWP Downl	TDD configuration	Config 1							
Downlink initial BWP configuration Downlink dictated BWP Configuration Uplink initial BWP configuration Downlink declared BWP Configuration Uplink initial BWP configuration Unlike William Variable Va					TDDConf		TDDCo		TDDCo
Downlink initial   Downlink initial   Downlink initial   Downlink dedicated   Downlink   Downlink		0 0 0 0							
Downlink initial BWP Configuration   Discrimination   D		Config 2,3							
DUBMY   DUBM	Downlink initial			.1.1		III. I . I		[111.1.1	
Downlink dedicated by Defending 1,2,3   DLBWP,1   DLBWP, DLBW   DLBW   DLBW   DLBW   DLBW   Configuration   Duplink initial BWP configuration   Config 1,2,3   DLBWP,0   DLBW		Config 1,2,3				DLBWP	.0.1		
BMP Configuration				DI RWP 1	DLBWP	DLBW	DLBW	DLBW	DLBW
Uplink initial BWP		Config 1,2,3							
Ulbwp.1   Ulbwp.1   Ulbwp.2   Ulbw		Config 1 2 2		ULBWP.0					
Description   Config 1,2,3   Config 1,2,3   Config 1,2,3   Config 1,2,3   TRS configuration   Config 1,2   TRS configuration   TRS configuration   Config 1   TRS configuration   TRS configuration   Config 1,2   TRS configuration   TRS conf		Corning 1,2,3							
TRS configuration		Config 1 2 3							
TOI state   Config 1,2,3   TOI state   T		7,2,0							
TCI state	TRS configuration	Config 1,2,3		N/A		N/A		N/A	
BWchannel   Config 1,2,3   Config 1,2   Substituting   Config 1,2   Config 1,2   Config 3   Substituting   Config 4   Substituting   Config 5   Substituting   Config 6   Substituting   Config 6   Substituting   Config 7   Substituting   Config 8   Substituting   Config 9   Substituting   Config 9   Substituting   Config 1   Substituting   Config 2   Substituting   Config 3   Substituting	TCI state			TCI State		TCI Sto		TCI Sto	
BWchannel	TOTSIALE	Config 1,2,3							
Config 1, 2	BWchannel		MHz		3.3		10.0		10.0
Config 3		Config 1,2			400.		400.		400.
Config 3						52		52	
Config 3									
PDSCH Reference measurement channel		Config 3		= 106			00		00
PDSCH Reference measurement channel				00.4.4					
Config 2		Config 1							
TDD					1				
Config 3		Config 2			-		-		-
Config 1	channel	0			1				
RMSI CORESET   Config 2		Config 3							
RMSI CORESET   Parameters		Config 1							
Parameters		- Coming 1							
Config 3		Config 2			-		-		-
Config 1	Farameters	-							
Config 1		Config 3							
Config 1		0							
CORESET Parameters         Config 2         CCR.1.1 TDD         - 1 TDD	Dedicated	Config 1		FDD					
Parameters		Config 2			_		_		_
Config 3		Coming 2							_
OCNG Patterns         OP.1           SSB configuration         Config 1,2         SSB.1 FR1 SSB.3 FR1 SSB.3 FR1 SSB.3 FR1 SSB.3 FR2 SSB.2 FR2 SSB.2 FR2 FR1         SMTC configuration           EPRE ratio of PSS to SSS EPRE ratio of PBCH DMRS to SSS EPRE ratio of PBCH DMRS to SSS EPRE ratio of PDCCH DMRS to SSS EPRE ratio of PDCCH to PDCCH DMRS to SSS EPRE ratio of PDSCH DMRS to SSS         dB         0		Config 3							
SSB configuration	OCNG Patterns	_		טטו				טטוו ן	
SSB configuration	CONOT AUDITS	0 5 4 6	1	SSB.1				SSB.1	
SSB.2 FR2 SSB.2 FR2 SSB.2 FR2  SMTC configuration  EPRE ratio of PSS to SSS  EPRE ratio of PBCH_DMRS to SSS  EPRE ratio of PDCCH_DMRS  EPRE ratio of PDCCH_DMRS to SSS  EPRE ratio of PDCCH_DMRS to SSS  EPRE ratio of PDCCH_DMRS to SSS  EPRE ratio of PDSCH_DMRS to SSS	CCD ******* ('	Contig 1,2			SSB.3		SSB.3		SSB.3
SMTC configuration  EPRE ratio of PSS to SSS  EPRE ratio of PBCH_DMRS to SSS  EPRE ratio of PDCH DMRS to SSS  EPRE ratio of PDSCH_DMRS  EPRE ratio of PDSCH_DMRS	SSB configuration	Config 2							
EPRE ratio of PSS to SSS  EPRE ratio of PBCH_DMRS to SSS  EPRE ratio of PBCH to PBCH_DMRS  EPRE ratio of PDCCH_DMRS to SSS  EPRE ratio of PDCCH_DMRS to SSS  EPRE ratio of PDSCH_DMRS to SSS  EPRE ratio of PDSCH_DMRS to SSS  EPRE ratio of PDSCH_DMRS to SSS		Corning 5		FR1				FR1	
EPRE ratio of PBCH_DMRS to SSS  EPRE ratio of PBCH_DMRS  EPRE ratio of PDCCH_DMRS to SSS  EPRE ratio of PDCCH_DMRS  EPRE ratio of PDSCH_DMRS to SSS  EPRE ratio of PDSCH_DMRS to SSS  EPRE ratio of PDSCH_DMRS  EPRE ratio of PDSCH_DMRS		200				SMTC	.1		
EPRE ratio of PBCH to PBCH_DMRS  EPRE ratio of PDCCH_DMRS to SSS  EPRE ratio of PDCCH_DMRS  EPRE ratio of PDSCH_DMRS to SSS  EPRE ratio of PDSCH_DMRS  EPRE ratio of PDSCH_DMRS			4						
EPRE ratio of PDCCH_DMRS to SSS  EPRE ratio of PDCCH to PDCCH_DMRS  EPRE ratio of PDSCH_DMRS to SSS  EPRE ratio of PDSCH to PDSCH_DMRS									
EPRE ratio of PDCCH to PDCCH_DMRS  EPRE ratio of PDSCH_DMRS to SSS  EPRE ratio of PDSCH to PDSCH_DMRS			1						
EPRE ratio of PDSCH_DMRS to SSS EPRE ratio of PDSCH to PDSCH_DMRS						0			
EPRE ratio of PDSCH to PDSCH_DMRS			1						
			1						
			1						

EPRE ra	tio of OCNG to OCNG DMRS Note							
		NA		NA		NA		
Propagation conditions		Link		Link		Link		
		only,	AWGN	only,	AWGN	only,	AWGN	
		see	AWGIN	see		see		
		clause		clause		clause		
		A.3.7A		A.3.7A		A.3.7A		
Note 1:	Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.							
Note 2:	Interference from other cells and no		cified in the	test is assi	umed to be	constant ov	ver	
	subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.							
Note 3:	SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.							

receiver antenna port.

Note 5: All parameters apply for configuration 1 and 2

Note 4:

Table A.5.5.3.2.1-3: OTA related test parameters for FR1 PCell activation case with FR2 SCell

SS-RSRP minimum requirements are specified assuming independent interference and noise at each

D.		11:4		Cell 2			Cell 1			
P	arameter	Unit	T1	T2	T3	T1	T2	T3		
Angle of arrival configuration			According to clause A.3.15.1			NA				
$N_{oc}^{}$ Note1		dBm/15kHz	15kHz -112							
$N_{oc}$ Note1	Config 1,2 Config 3,	dBm/SCS	-102.97							
SS-RSRP <sup>Note2</sup>	Config 1,2 Config 3	dBm/SCS Note3 -85.97		-85.97		] ,,,	, NA			
$\hat{E}_s/N_{oc}$	Config 1,2,3	dB	17		· · · · · · · · · · · · · · · · · · ·		only, see o	ciause		
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$		dB	17		17					
lo <sup>Note2</sup>	Config 1,2	dBm/ChBW <sup>N</sup>	-56.90		50.00					
	Config 3	ote4,Note6			-30.80					

Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.

Note 2: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone

Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone

Note 6: ChBW is 94.04 MHz for Cell2, 9.36 MHz for Cell 3 in configurations 1,2,4,5, 38.1 MHz in configurations 3,6

# A.7.5.3.2.2 Test Requirements

The test requirements defined in clause A.7.5.3.1.2 shall apply to this test case, except  $T_{activation\_time}$  will be replaced with the value [TBD] as defined in clause 8.3.

# A.7.5.4 Viod

# A.7.5.5 Beam Failure Detection and Link recovery procedures

# A.7.5.5.1 Beam Failure Detection and Link Recovery Test for FR2 PCell configured with SSB-based BFD and LR in non-DRX mode

# A.7.5.5.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set  $q_0$  configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR2 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.7.5.5.1.1-1, A.7.5.5.1.1-2, A.7.5.5.1.1-3 and A.7.5.5.1.1-4 below. There is one cell, cell 1 which is the active cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.7.5.5.1.1-1 shows the variation of the downlink SNR of the SSB in set  $q_0$  in the active cell to emulate SSB based beam failure. Figure A.7.5.5.1.1-1 additionally shows the variation of the downlink SNR of the SSB in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [2] ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test 2.

Table A.7.5.5.1.1-1: Supported test configurations for FR2 PCell

Configuration	ation Description				
1	TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth				
2	TDD duplex mode, 240 kHz SSB SCS, 100 MHz bandwidth				
Note: The UE is	Note: The UE is only required to pass in one of the supported test configurations in FR2				

Table A.7.5.5.1.1-2: General test parameters for FR2 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode

Paran	Parameter		Value	Comment
			Test 1	
Active PCell			Cell 1	
RF Channel Nun	nber		1	
Duplex mode	Config 1, 2		TDD	
BW <sub>channel</sub>	Config 1, 2		100: N <sub>RB,c</sub> = 66	
DL initial BWP configuration	Config 1, 2		DLBWP.0.1	
DL dedicated BWP	Config 1, 2		DLBWP.1.1	
configuration				
UL initial BWP configuration	Config 1, 2		ULBWP.0.1	
UL dedicated BWP configuration	Config 1, 2		ULBWP.1.1	
TDD Configuration	Config 1, 2		TDDConf.3.1	
CORESET Reference Channel	Config 1, 2		CR. 3.1 TDD	

	1 -				1
SSB		Config 1, 2		SSB.1 FR2	
Configu	uration				
SMTC		Config 1, 2		SMTC.3	
Configu	uration				
PDSCF	H/PDCC C	Config 1, 2		120 KHz	
H subc	arrier				
spacing	9				
PRACE	1 (	Config 1, 2		Table A.3.8.3.4	
Configu	uration	-			
SSB in	dex assigne	d as BFD RS		0	
(q <sub>0</sub> )	ŭ				
(-10)					
SSB in	dex assigne	d as CBD		1	
RS (q <sub>1</sub> )				•	
110 (91)	•				
TCI	1	Config 1, 2		TBD	
Configu		Joining 1, 2		186	
Connigo	aration				
OCNG	parameters			OP.1	
CP len				Normal	
		and Antenna		2x2 Low	
Configu					
	DCI forma	ıt		1-0	
	Number of	f Control		2	
Beam	OFDM syr	mbols			
failur	Aggregation		CCE	8	
е		ypothetical	dB	0	
detec	PDCCHR	E energy to	u u u	<b>o</b>	
tion	average C				
trans		OI-INO INL			
missi	energy				
on	Ratio of hy	ypothetical	dB	0	
		MRS energy			
para	to average	CSI-RS RE			
meter	energy				
S	DMRS pre	ecoder		REG bundle size	
	granularity			_	
	REG bund			6	
DRX		0120		OFF	
	ttorn ID			•	
	ittern ID			gp0	\A/I 4I- C !!!
rimins	/ncOutOtSyl	ncThreshold		absent	When the field is
					absent, the UE
					applies the value
					0. (Table 8.1.1-1).
rsrp-Th	resholdSSB	3	dBm	TBD	Threshold used
					for Q <sub>out_LR_SSB</sub>
powerC	ControlOffset	tSS		db0	Used for deriving
'					rsrp-
					ThresholdCSI-RS
heamF	ailureInstan	ceMaxCount		n1	see clause 5.17
Deam	andronistant	SSIVIGAGOUITE		111	of TS 38.321 [7]
boom	oiluroDoto -t	tionTimor		nhfd 1	see clause 5.17
Deamir	ailureDetect	uonnine		pbfd4	
					of TS 38.321 [7]

CSI-RS configuration for CSI reporting	Config 1, 2		[CSI-RS.3.1 TDD]	
TCI states			[TCI.State.0]	
CSI-RS for tracking	Config 1, 2		[TRS.2.1 TDD]	
SSB index assigned a	s RLM		0, 1	
T310 Timer		ms	1000	
N310			2	
T1		S	1	During this time the the UE shall be fully synchronized to cell 1
T2		S	2.61	
T3		S	1.64	
T4		S	0	
T5		S	1.01	
D1		S	0.97	
			to the UE prior to the start of time p mitted after T1 starts.	period T1.

Editor's note: An additional RS for RLM, different from BFD-RS at constant high SNR shall be configured as part of the test configuration.

Table A.7.5.5.1.1-3: Cell specific test parameters for FR2 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode

Parameter		Unit	Test 1					
		T1	T2	Т3	T4	T5		
EPRE ratio of PDCCH DI	MRS to SSS	dB						
EPRE ratio of PDCCH to	PDCCH DMRS	dB						
EPRE ratio of PBCH DMI	RS to SSS	dB						
EPRE ratio of PBCH to P	BCH DMRS	dB						
EPRE ratio of PSS to SS	S	dB			0			
EPRE ratio of PDSCH DMRS to SSS		dB						
EPRE ratio of PDSCH to	EPRE ratio of PDSCH to PDSCH DMRS							
EPRE ratio of OCNG DM	RS to SSS	dB						
EPRE ratio of OCNG to C	CNG DMRS	dB						
SNR_SSB of set q <sub>0</sub>	Config 1	dB	5	-3	-12	-12	-12	
Config 2		T ub	5	-3	-12	-12	-12	
SNR_SSB of set q1         Config 1           Config 2         Config 2		dB	-12	-12	5	5	5	
		uв	-12	-12	5	5	5	
λ/ Config 1		dBm/12	TBD					
$N_{oc}$	Config 2	0 KHz			TBD		·	

Propagation condition TDL-A 30ns 75Hz						
Note 1:	OCNG shall be used such that the resource	s in Cell 1 are fully allocated and a constant total				
	transmitted power spectral density is achiev	ed for all OFDM symbols.				
Note 2:		ssigned to the UE prior to the start of time period T1.				
Note 3:	NZP CSI-RS resource set configuration for	CSI reporting are assigned to the UE prior to the start				
	of time period T1.					
Note 4:	Measurement gap configuration is assigned to the UE prior to the start of time period T1.					
Note 5:	The timers and layer 3 filtering related parameters are configured prior to the start of time period					
	T1.					
Note 6:	The signal contains PDCCH for UEs other than the device under test as part of OCNG.					
Note 7:	SNR levels correspond to the signal to noise ratio over the SSS REs.					
Note 8:	The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3					
	respectively in figure A.7.5.5.1.1-1.					
Note 9:	The SNR values are specified for testing a l	JE which supports 2RX on at least one band. For				
	testing of a UE which supports 4RX on all b	ands, the SNR during T3 is modified as specified in				
	clause [A.3.6].					

Table A.7.5.5.1.1-4: Measurement gap configuration for FR2 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode

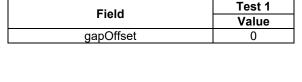




Figure A.7.5.5.1.1-1: SNR variation SSB for SSB-based beam failure detection and link recovery testing in non-DRX mode

# A.7.5.5.1.2 Test Requirements

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q<sub>1</sub>.

No later than time point F occurring no later than D1 = [960+10] ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit preamble on a beam associated with the candidate beam set  $q_1$  earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

# A.7.5.5.2 Beam Failure Detection and Link Recovery Test for FR2 PCell configured with SSB-based BFD and LR in DRX mode

# A.7.5.5.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set  $q_0$  configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR2 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.7.5.5.2.1-1, A.7.5.5.2.1-2, A.7.5.5.2.1-3, A.7.5.5.2.1-4 and A.7.5.5.2.1-5 below. There is one cell, cell 1 which is the active cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.7.5.5.2.1-1 shows the variation of the downlink SNR of the SSB in set  $q_0$  in the active cell to emulate SSB based beam failure. Figure A.7.5.5.2.1-1 additionally shows the variation of the downlink SNR of the SSB in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [2] ms. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

Table A.7.5.5.2.1-1: Supported test configurations for FR2 PCell

Configuration	Description				
1	TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth				
2	TDD duplex mode, 240 kHz SSB SCS, 100 MHz bandwidth				
Note: The UE is only required to pass in one of the supported test configurations in FR2					

Table A.7.5.5.2.1-2: General test parameters for FR2 PCell for SSB-based beam failure detection and link recovery testing in DRX mode

Parameter		Unit	Value	Comment
			Test 1	
Active PCell			Cell 1	
RF Channel Number			1	
Duplex mode	Config 1, 2		TDD	
BW <sub>channel</sub>	Config 1, 2		100: N <sub>RB,c</sub> = 66	
DL initial BWP configuration	Config 1, 2		DLBWP.0.1	
DL dedicated BWP configuration	Config 1, 2		DLBWP.1.1	
UL initial BWP configuration	Config 1, 2		ULBWP.0.1	
UL dedicated BWP configuration	Config 1, 2		ULBWP.1.1	
TDD Configuration	Config 1, 2		TDDConf.3.1	
CORESET Reference Channel	Config 1, 2		CR. 3.1 TDD	
SSB Configuration	Config 1, 2		SSB.1 FR2	
SMTC Configuration	Config 1, 2		SMTC.3	
PDSCH/PDCCH subcarrier spacing	Config 1, 2		120 KHz	

PRACH Configuration Config 1, 2			Table A.3.8.3.4		
SSB index assigned as BFD RS (q <sub>0</sub> )			0		
SSB index assigned as CBD RS (q <sub>1</sub> )				1	
TCI Configura	tion Cor	nfig 1, 2		TBD	
OCNG parame	eters			OP.1	
CP length Correlation Ma	atrix and Antenr	na		Normal 2x2 Low	
Configuration	atrix aria 7 tricerii	iu		ZAZ ŁOW	
Beam failure	DCI format			1-0	
detection transmission	Number of Co			2	
parameters	OFDM symbol Aggregation le		CCE	8	
parameters	Ratio of hypot	hetical	dB	0	
	PDCCH RE e average CSI-l energy	nergy to			
	Ratio of hypot PDCCH DMR to average CS energy	S energy	dB	0	
	DMRS precod	ler		REG bundle size	
	granularity REG bundle s	rizo		6	
DRX	NEG bullule s	oize		DRX.3	A.3.3.3
Gap pattern ID	)			N.A.	7
rlmInSyncOutOfSyncThreshold			absent	When the field is absent, the UE applies the value 0. (Table 8.1.1-1).	
rsrp-Threshold	rsrp-ThresholdSSB		dBm	TBD	Threshold used for Q <sub>out_LR_SSB</sub>
powerControl0	powerControlOffsetSS			db0	Used for deriving rsrp- ThresholdCSI- RS
beamFailureIn	stanceMaxCou	nt		n1	see clause 5.17 of TS 38.321 [7]
beamFailureD	etectionTimer			pbfd4	see clause 5.17 of TS 38.321 [7]
CSI-RS config CSI reporting	uration for	Config 1, 2		[CSI-RS.3.1 TDD]	A.3.14.2
TCI states	TCI states			[TCI.State.0]	
	CSI-RS for tracking  Config 1, 2			[TRS.2.1 TDD]	
SSB index assigned as RLM RS			0, 1		
T310 Timer		ms	1000		
N310 T1			S	<u>2</u> 1	During this time the the UE shall be fully synchronized to
					cell 1
T2			S	3.37	
T3			S	2.8	
T4			S	0	
T5			S	0.61	

D1	S	0.57	
Note 1: All configurations are assigned Note 2: UE-specific PDCCH is not trans		E prior to the start of time period T1 fter T1 starts.	

Table A.7.5.5.2.1-3: Cell specific test parameters for FR2 PCell for SSB-based beam failure detection and link recovery testing in DRX mode

Parameter		Unit	Test 1				
		T1	T2	Т3	T4	T5	
EPRE ratio of PDCCH D	dB			•	•	•	
EPRE ratio of PDCCH to	PDCCH DMRS	dB					
EPRE ratio of PBCH DM	IRS to SSS	dB					
EPRE ratio of PBCH to I	PBCH DMRS	dB					
EPRE ratio of PSS to SS	SS	dB	1		0		
EPRE ratio of PDSCH D	MRS to SSS	dB	1				
EPRE ratio of PDSCH to	PDSCH DMRS	dB					
EPRE ratio of OCNG DN	/IRS to SSS	dB					
EPRE ratio of OCNG to	OCNG DMRS	dB					
SNR_SSB of set q <sub>0</sub>	Config 1	dB	5	-3	-12	-12	-12
	Config 2		5	-3	-12	-12	-12
SNR SSB of set q <sub>1</sub>	Config 1	dB	-12	-12	-12	-3	10
- Config 2		ub.	-12	-12	-12	-3	10
SNR_CSI-RS of RLM-R	Config 1	dB	5	5	5	5	5
OHIT_GOT TO OTTEM IT	Coning 2		5	5	5	5	5
$N_{oc}$	Config 1	dBm/12	TBD				
	Config 2	0 KHz	TBD				
Propagation condition			TDL-A 30ns 75Hz				
Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start					riod T1.		
of time period T1.  Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.  Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.					period		
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3							
respectively in figure A.7.5.5.1.1-1.  Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause [A.3.6].							

Table A.7.5.5.2.1-4: Measurement gap configuration for FR2 PCell for SSB-based beam failure detection and link recovery testing in DRX mode

Eiold	Test 2
Field	Value
gapOffset	0

#### Table A.7.5.5.2.1-5: Void



Figure A.7.5.5.2.1-1: SNR variation for SSB-based beam failure detection and link recovery testing in non-DRX mode

# A.7.5.5.2.2 Test Requirements

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q<sub>1</sub>.

No later than time point F occurring no later than D1 = [560+10] ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit preamble on a beam associated with the candidate beam set  $q_1$  earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

# A.7.5.5.3 Beam Failure Detection and Link Recovery Test for FR2 PCell configured with CSI-RS-based BFD and LR in non-DRX mode

# A.7.5.5.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set  $q_0$  configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candicate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR2 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.7.5.5.3.1-1, A.7.5.5.3.1-2, and A.7.5.5.3.1-3 below. There is one cell, cell 1 which is the active cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.7.5.5.3.1-1 shows the variation of the downlink SNR of the CSI-RS in set  $q_0$  in the active cell to emulate CSI-RS based beam failure. Figure A.7.5.5.3.1-1 additionally shows the variation of the downlink SNR of the CSI-RS in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [2] ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements without gaps.

# Table A.7.5.5.3.1-1: Supported test configurations for FR2 PCell

Configuration	Description
1	TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth

Table A.7.5.5.3.1-2: General test parameters for FR2 PCell for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode

Parameter		Unit	Value Test 1	Comment
Active PCell			Cell 1	
RF Channel Number			1	
Duplex mode	Config 1		TDD	
TDD Configuration	Config 1		TDDConf.3.1	
CORESET	Config 1		CR.3.1 TDD	A.3.1.2
Reference Channel	January 1			1
SSB Configuration	Config 1		SSB.1 FR2	A.3.10
SMTC Configuration	Config 1		SMTC.3	A.3.11
PDSCH/PDCCH	Config 1		120KHz	
subcarrier spacing				
csi-RS-Index assigned			[0]	
failure detection RS in	set q <sub>0</sub>			
TRS configuration			TRS.2.1 TDD	
TCI configuration			CSI-RS.Config.0	
OCNG parameters			OP.1	A.3.2.1
CP length	A (		Normal	
Correlation Matrix and Configuration			2x2 Low	
	DCI format		1-0	
5 ( "	Number of		2	
Beam failure	Control			
detection transmission	OFDM			
parameters	symbols Aggregation	CCE	8	
parameters	level	CCE	0	
	Ratio of	dB	0	
	hypothetical PDCCH RE energy to average CSI- RS RE energy	GD.	Ç	
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0	
	DMRS precoder granularity		REG bundle size	
	REG bundle size		6	
DRX	<u> </u>		OFF	
Gap pattern ID			N.A.	
csi-RS-Index assigned beam detection RS in			1	
rlmlnSyncOutOfSyncT	hreshold		absent	When the field is absent, the UE applies the value 0. (Table 8.1.1-1).
rsrp-ThresholdSSB		dBm	TBD	Threshold used for Q <sub>in_LR_SSB</sub>
powerControlOffsetSS			NA	Used for deriving rsrp- ThresholdCSI-RS

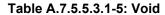
beamFailureInstanceM	axCount		n1	see clause 5.17 of TS 38.321 [7]
beamFailureDetectionTimer			pbfd4	see clause 5.17 of TS 38.321 [7]
CSI-RS configuration for q <sub>0</sub> and q <sub>1</sub>	Config 1		CSI-RS.3.2 TDD	A.3.14.2
CSI-RS configuration for CSI reporting	Config 1		CSI-RS.3.1 TDD	A.3.14.2
csi-RS-Index assigned	as RLM RS		0, 1	A.3.14.2
T310 Timer		ms	1000	
N310			2	
T1		Ø	1	During this time the the UE shall be fully synchronized to cell 1
T2		s	1.17	
T3		s	0.9	
T4	`	s	0	
T5		s	0.31	
D1		s	0.27	
Note 1: UE-specific	PDCCH is not tra	nsmitted aft	er T1 starts.	

Table A.7.5.5.3.1-3: Cell specific test parameters for FR2 PCell for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode

Paramete	r	Unit	Test 1				
			T1	T2	Т3	T4	T5
EPRE ratio of PDCCH DM	RS to SSS	dB					
EPRE ratio of PDCCH to F	DCCH DMRS	dB					
EPRE ratio of PBCH DMR	S to SSS	dB					
EPRE ratio of PBCH to PB	CH DMRS	dB					
EPRE ratio of PSS to SSS		dB			0		
EPRE ratio of PDSCH DM	RS to SSS	dB					
EPRE ratio of PDSCH to P	DSCH DMRS	dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
SNR_CSI-RS of set q <sub>0</sub>	Config 1	dB	5	-3	-12	-12	-12
SNR_CSI-RS of set q <sub>1</sub>	Config 1	dB	-12	-12	5	5	5

$N_{oc}$		Config 1	dBm/15 KHz	TBD	
	Propagation condition TDL-A 30ns 75Hz				
Note 1:				in Cell 1 are fully allocated and a constant total	
	transmitted power	er spectral density	is achieve	ed for all OFDM symbols.	
Note 2:	The uplink resou	irces for CSI repoi	rting are as	ssigned to the UE prior to the start of time period T1.	
Note 3:	NZP CSI-RS res	ource set configu	ration for C	SI reporting are assigned to the UE prior to the start	
	of time period T1.				
Note 4:	Measurement gap configuration is assigned to the UE prior to the start of time period T1.				
Note 5:					
Note 6:		ins PDCCH for UI	Es other th	an the device under test as part of OCNG.	
Note 7:				ratio over the SSS REs.	
Note 8:				T5 is denoted as SNR1, SNR2 and SNR3	
	respectively in figure A.7.5.5.3.1-1.				
Note 9:					
	testing of a UE v	vhich supports 4R	X on all ba	nds, the SNR during T3 is modified as specified in	
	clause [A.3.6].				

# Table A.7.5.5.3.1-4: Void



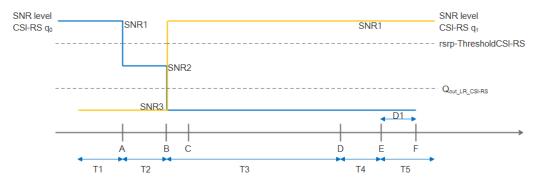


Figure A.7.5.5.3.1-1: SNR variation for CSI-RS based beam failure detection and link recovery testing in non-DRX mode

# A.7.5.5.3.2 Test Requirements

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the shall detect beam failure and initiat link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set  $q_1$ .

No later than time point F occurring no later than D1 = [260+10] ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit preamble on a beam associated with the candidate beam set  $q_1$  earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

# A.7.5.5.4 Beam Failure Detection and Link Recovery Test for FR2 PCell configured with CSI-RS-based BFD and LR in DRX mode

# A.7.5.5.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set  $q_0$  configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candicate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR2 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.7.5.5.4.1-1, A.7.5.5.4.1-2, A.7.5.5.4.1-3, and A.7.5.5.4.1-4 below. There is one cell, cell 1 which is the active cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.7.5.5.4.1-1 shows the variation of the downlink SNR of the CSI-RS in set  $q_0$  in the active cell to emulate CSI-RS based beam failure. Figure A.7.5.5.4.1-1 additionally shows the variation of the downlink SNR of the CSI-RS in set  $q_1$  of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of [2] ms. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

Table A.7.5.5.4.1-1: Supported test configurations for FR2 PCell

Configuration	Description
1	TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth

Table A.4.5.1.1.1-2: General test parameters for FR2 PCell for CSI-RS-based beam failure detection and link recovery testing in DRX mode

Parameter		Unit	Value Test 1	Comment	
			10311		
Active PCell			Cell 1		
RF Channel Number			1		
Duplex mode	Config 1		TDD		
TDD Configuration	Config 1		TDDConf.3.1		
CORESET Reference Channel	Config 1		CR.3.1 TDD	A.3.1.2	
SSB Configuration	Config 1		SSB.1 FR2	A.3.10	
SMTC Configuration	Config 1		SMTC.3	A.3.11	
PDSCH/PDCCH	Config 1		120 KHz		
subcarrier spacing					
csi-RS-Index assigned as	beam failure		[0]		
detection RS in set q <sub>0</sub>					
TRS configuration			TRS.2.1 TDD		
TCI configuration			CSI-RS.Config.0		
OCNG parameters			OP.1	A.3.2.1	
CP length			Normal		
Correlation Matrix and Anti Configuration	tenna		2x2 Low		
_	DCI format		1-0		
	Number of		2		
Beam failure detection transmission parameters	Control OFDM				
	symbols				
	Aggregation level	CCE	8		
	Ratio of	dB	0		
	hypothetical PDCCH RE energy to average CSI-				
	RS RĔ energy				
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0		
	DMRS precoder granularity		REG bundle size		
	REG bundle		6		
DRX	1		DRX.3	A.3.3.3	
Gap pattern ID			N.A.		
csi-RS-Index assigned as beam detection RS in set			1		
rlmInSyncOutOfSyncThre	shold		absent	When the field is absent, the UE applies the value 0. (Table 8.1.1-1).	
rsrp-ThresholdSSB		dBm	TBD	Threshold used for Q <sub>in_LR_SSB</sub>	
powerControlOffsetSS			db0	Used for deriving rsrp- ThresholdCSI-RS	

beamFailureInstanceMax(		n1	see clause 5.17 of TS 38.321 [7]	
beamFailureDetectionTim		pbfd4	see clause 5.17 of TS 38.321 [7]	
CSI-RS configuration for q <sub>0</sub> and q <sub>1</sub>	Config 1		CSI-RS.3.2 TDD	A.3.14.2
CSI-RS configuration for CSI reporting	Config 1		CSI-RS.3.1 TDD	A.3.14.2
csi-RS-Index assigned as RLM RS	Config 1		CSI-RS.3.2 TDD	A.3.14.2
T310 Timer	T310 Timer		1000	
N310			2	
T1		S	1	During this time the the UE shall be fully synchronized to cell 1
T2		S	5.43	
T3	T3		5.16	
T4		s	0	
T5		s	0.31	
D1	•	S	0.27	
Note 1: UE-specific PD	CCH is not transr	mitted after T	Γ1 starts.	

Table A.7.5.5.4.1-3: Cell specific test parameters for FR2 PCell for CSI-RS-based beam failure detection and link recovery testing in DRX mode

Paramete	er	Unit	Test 1				
			T1	T2	T3	T4	T5
EPRE ratio of PDCCH DM	IRS to SSS	dB					
EPRE ratio of PDCCH to	PDCCH DMRS	dB					
EPRE ratio of PBCH DMF	S to SSS	dB					
EPRE ratio of PBCH to Pt	3CH DMRS	dB					
EPRE ratio of PSS to SSS	3	dB			0		
EPRE ratio of PDSCH DM	IRS to SSS	dB					
EPRE ratio of PDSCH to I	PDSCH DMRS	dB					
EPRE ratio of OCNG DMF	dB						
EPRE ratio of OCNG to OCNG DMRS		dB	1				
SNR_CSI-RS of set q <sub>0</sub>	Config 1	dB	5	-3	-12	-12	-12
SNR CSI-RS of set q <sub>1</sub>	Config 1	dB	-12	-12	5	5	5

$N_{oc}$		Config 1	dBm/12	TBD	
1 oc			0 KHz		
Propagat	TDL-A 30ns 75Hz				
Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant transmitted power spectral density is achieved for all OFDM symbols.					
Note 2:				ssigned to the UE prior to the start of time period T1.	
Note 3:					
Note 4:	Measurement gap configuration is assigned to the UE prior to the start of time period T1.				
Note 5:					
Note 6:				an the device under test as part of OCNG.	
Note 7:	SNR levels corre	espond to the sign	al to noise	ratio over the SSS REs.	
Note 8:	The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.7.5.5.4.1-1.				
Note 9:	, , ,				

Table A.7.5.5.4.1-4: Void

Table A.7.5.5.4.1-5: Void

Table A.7.5.5.4.1-6: Void

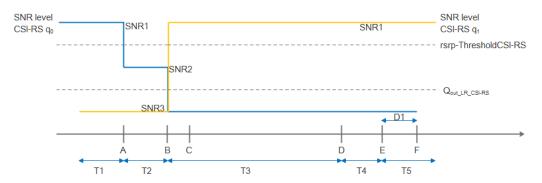


Figure A.7.5.5.4.1-1: SNR variation for CSI-RS-based beam failure detection and link recovery testing in DRX mode

#### A.7.5.5.4.2 Test Requirements

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiat link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q<sub>1</sub>.

No later than time point F occurring no later than D1 = [260+10] ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit preamble on a beam associated with the candidate beam set  $q_1$  earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

# A.7.5.5.5 Scheduling availability restriction during Beam Failure Detection and Link Recovery for FR2 PCell configured with SSB-based BFD and LR in non-DRX mode

## A.7.5.5.5.1 Test Purpose and Environment

The purpose is to test scheduling availability restrictions when the UE is performing beam failure detection or when the UE is performing L1-RSRP measurement for candidate beam detection, when no DRX is used. This test will verify the scheduling availability restriction requirements in clause 8.5.7 and 8.5.8.

The test parameters are given in Tables A.7.5.5.5.1-1, A.7.5.5.5.1-2 and A.7.5.5.5.1-3 below. There is one cell, cell 1 which is the active cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.7.5.5.5.1-1 shows the variation of the downlink SNR of the SSB in set q<sub>0</sub> in the active cell to emulate SSB based beam failure. Figure A.7.5.5.5.1-1 additionally shows the variation of the downlink SNR of the SSB in set q<sub>1</sub> of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. This test will focus on the scheduling availability during beam failure detection) and candidate beam detection. In the test, DRX configuration is not enabled. Test is to test the scheduling availability restriction of UE performing beam failure detection and candidate beam detection when SSB RS configured for Beam failure detection and candidate beam detection. During the test the UE is scheduled to transmit continuously in UL.

Table A.7.5.5.5.1-1: Supported test configurations for FR2 PCell

Configura	tion	Description
1		LTE FDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
2		LTE TDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
Note: Th	he UE is	only required to be tested in one of the supported test configurations

Table A.7.5.5.5.1-2: General test parameters for FR2 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode

Pa	Parameter		Value	Comment	
			Test 1		
Active PCell			Cell 1		
RF Channel Number	054.0		1		
Duplex mode	Config 1,2		TDD		
TDD Configuration DL initial BWP	Config 1,2 Config 1, 2		TDDConf.3.1 DLBWP.0.1		
configuration	Corning 1, 2		DLBVVF.U.1		
DL dedicated BWP configuration	Config 1, 2		DLBWP.1.1		
UL initial BWP configuration	Config 1, 2		ULBWP.0.1		
UL dedicated BWP configuration	Config 1, 2		ULBWP.1.1		
CORESET Reference	Config 1,2		CR. 3.1 TDD		
Channel					
SSB Configuration	Config 1,2		SSB.1 FR2		
SMTC Configuration	Config 1,2		SMTC.1		
PDSCH/PDCCH	Config 1,2		120 KHz		
subcarrier spacing SSB index assigned as I	RED DS (gs)		0		
SSB index assigned as 0			1		
TRS configuration	SBD NO (q1)		TRS.2.1 TDD		
TCI configuration			TCI.State.0		
OCNG parameters			OP.1		
AoA Setup			Setup 1	A.3.15.1	
CP length			Normal	7	
Correlation Matrix and A	ntenna Configuration		2x2 Low		
	DCI format		1-0		
Beam failure detection	Number of Control OFDM symbols		2		
transmission	Aggregation level	CCE	8		
parameters	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	0		
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0		
	DMRS precoder granularity		REG bundle size		
	REG bundle size		6		
DRX			OFF	DRX is not in use	
Gap pattern ID			N.A.	No measurement gap pattern is configured	
ssb-Index			2	Number of SSB indexes used for beam failure detection	
rlmInSyncOutOfSyncThreshold			absent	When the field is absent, the UE applies the 10%	
rsrp-ThresholdSSB		dBm	[-94.5]	Threshold used for Q <sub>in_LR</sub>	
powerControlOffsetSS			db0	Used for deriving rsrp- ThresholdCSI-RS	
beamFailureInstanceMa	xCount		n2	see TS 38.321 [7], clause 5.17	

beamFailureDetectionTimer			pbfd4	see TS 38.321 [7],
				clause 5.17
CSI Configuration for	Config 1,2		CSI-RS.3.3 TDD	A.3.14.2
reporting				
T310 Timer		ms	1000	
N310			2	
T1		s	1	During this time the the UE shall be fully synchronized to cell 1
T2		S	2.6	
T3		S	1.64	
T4		S	0	
T5		S	1.01	
D1			0.97	
Note 1: All configurat	ions are assigned to the UE pri	or to the s	tart of time period T1	:
Note 2: UF-specific PDCCH is not transmitted after T1 starts.				

Table A.7.5.5.5.1-3: Cell specific test parameters for FR2 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode

Parameter		Unit	Test 1				
		T1	T2	Т3	T4	T5	
EPRE ratio of PDCCH DN	MRS to SSS	dB					
EPRE ratio of PDCCH to	PDCCH DMRS	dB					
EPRE ratio of PBCH DMF	RS to SSS	dB					
EPRE ratio of PBCH to P	BCH DMRS	dB					
EPRE ratio of PSS to SS	S	dB	0				
EPRE ratio of PDSCH DN	/IRS to SSS	dB					
EPRE ratio of PDSCH to	PDSCH DMRS	dB					
EPRE ratio of OCNG DM	RS to SSS	dB					
EPRE ratio of OCNG to C	CNG DMRS	dB					
SNR_SSB of set q <sub>0</sub>	Config 1	dB	5	-3	-12	-12	-12
	Config 2	uБ	5	-3	-12	-12	-12
SNR SSB of set q <sub>1</sub>	Config 1	dB	-12	-12	5	5	5
SINK_SSB of set q1	Config 2	uБ	-12	-12	5	5	5
N Config 1		dBm/15	-104.7				
$N_{oc}$	Config 2	KHz	-104.7				
Propagation condition			TDL-A 30ns 75Hz				

- Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.
- Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.
- Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period
- Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.
- Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.
- Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.7.5.5.5.1-1.
- Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause [A.3.6].

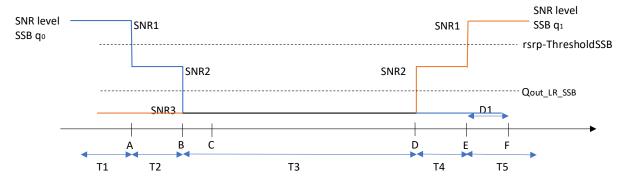


Figure A.7.5.5.5.1-1: SNR variation SSB for SSB-based beam failure detection and link recovery testing in non-DRX mode

# A.7.5.5.5.2 Test Requirements

The UE behaviour during time duration T3 follows the requirements defined in clause 8.5.7.3:

- The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/CSI-RS for tracking/CSI-RS for CQI on BFD-RS symbols to be measured for beam failure detection.

The UE behaviour during time durations T4 and T5 follows the requirements defined in clause 8.5.8.3:

- The UE is not expected to transmit PUCCH/PUSCH or receive PDCCH/PDSCH on reference symbols to be measured for candidate beam detection.

# A.7.5.6 Active BWP switch

## A.7.5.6.1 DCI-based and Timer-based Active BWP Switch

#### A.7.5.6.1.1 NR FR2- NR FR2 DL active BWP switch of PCell with non-DRX in SA

#### A.7.5.6.1.1.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement defined in clause 8.6, and interruption requirement on other active serving cell defined in clause 8.2.2.2.5.

The supported test configurations are shown in Table A.7.5.6.1.1.1-1 below. The test scenario comprises of one NR PCell (Cell 1) and one NR SCell (Cell 2) as given in Table A.7.5.6.1.1.1-2. NR Cell-specific parameters are specified in Table A.7.5.6.1.1.1-3 below. OTA related test parameters are shown in table A.7.5.6.1.1.1-4 below.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 1 and the time duration of T2.

PDCCHs indicating new transmissions shall be sent continuously on SCell (Cell 2) to ensure that the UE will have ACK/NACK sending.

Before the test starts,

UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), and Cell 2 (SCell) on radio channel 2 (SCC).

UE is configured with 2 different UE-specific downlink bandwidth parts for PCell, BWP-1 and BWP-2, in Cell 1 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.

UE is indicated in firstActiveDownlinkBWP-Id that the active DL BWP is BWP-1 in PCell.

UE is configured with a bwp-InactivityTimer timer value for PCell.

All cells have constant signal levels throughout the test.

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

## During T1,

Time period T1 starts when a DCI format 1\_1 command for PCell DL BWP switch, sent from the test equipment to the UE, is received at the UE side in PCell's slot # denoted i. The UE shall switch its bandwidth part from BWP-1 to BWP-2.

The UE shall be able to receive PDSCH no later than at the beginning of the DL slot right after PCell's DL slot  $(i+T_{BWPswitchDelay})$  as defined in clause 8.6 and starts to report valid ACK/NACK for the PCell no later than at the beginning of the DL slot right after slot  $(i+T_{BWPswitchDelay}+kI)$ . The UE shall be continuously scheduled on PCell's BWP-2 no later than at the beginning of the DL slot right after slot  $(i+T_{BWPswitchDelay})$ .

The starting time of SCell (Cell 2) interruption due to BWP switch on PCell shall occur within the BWP switch delay.

During T2, the test equipment won't transmit DCI format for PDSCH reception on PCell(Cell 1).

# During T3,

The time period T3 starts from the slot #j, where j is the beginning slot of the DL subframe immediately after the slot wherein *bwp-InactivityTimer* timer expires. The UE should switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1.

The UE shall be able to receive PDSCH no later than at the beginning of the DL slot right after PCell's DL slot  $(j+T_{BWPswitchDelay})$  as defined in clause 8.6 and starts to report valid ACK/NACK for the PSCell at latest at the beginning of the DL slot right after slot  $(j+T_{BWPswitchDelay}+kI)$ . The UE shall be continuously scheduled on PSCell's BWP-1 no later than the beginning of the DL slot right after slot  $(j+T_{BWPswitchDelay})$ .

The starting time of SCell (Cell 2) interruption due to BWP switch of PCell shall occur within the BWP switch delay.

The test equipment verifies the DL BWP switch time in PCell by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK is received.

The test equipment verifies that potential interruption to SCell is carried out in the correct time span by monitoring ACK/NACK sent in SCell during BWP switch of PCell, respectively.

Table A.7.5.6.1.1.1-1: DL BWP switch supported test configurations

Config	Description		
1	NR 120 kHz SSB SCS. 100 MHz bandwidth. TDD -TDD duplex mode		

Table A.7.5.6.1.1.1-2: General test parameters for DL BWP switch in SA

Parameter	Unit	Value	Comment
NR RF Channel Number		2	Two NR radio channel is used for this test
Active PCell		Cell 1	PCell on RF channel number 1.
Active SCell		Cell 2	SCell on RF channel number 2.
CP length		Normal	
DRX		OFF	For both PCell and PSCell
bwp-InactivityTimer	ms	200	
Cell-individual offset for cells	dB	0	Individual offset for cells on PCC.
on RF channel number 1	u D	U	
Cell-individual offset for cells	dB	0	Individual offset for cells on PSCC.
on RF channel number 2	ם	0	
Cell2 timing offset to cell1		3	Time alignment error as specified in TS
	μS	3	38.104 [13] clause 6.5.3.1.
T1	S	0.2	
T2	S	0.2	
T3	s	0.2	

Table A7.5.6.1.1.1-3: NR Cell specific test parameters for DL BWP switch in SA

Parameter	Unit	Cell 1	Cell2
Frequency Range		FR2	FR2
Duplex mode		TDD	
TDD configuration		TDDConf.3.1	
BWchannel		100 MH	z: N <sub>RB,c</sub> = 66
Active BWP ID		1, 2	3
Downlink initial BWP Configuration			3WP.0.2
Uplink initial BWP Configuration			3WP.0.2
Downlink active BWP-1 Configuration		DLBWP.1.3	-
Downlink active BWP-2 Configuration		DLBWP.1.3	-
Uplink active BWP-1 Configuration		ULBWP.1.3	-
Uplink active BWP-2 Configuration		ULBWP.1.3	-
PDSCH Reference measurement channel		SR.	3.1 TDD
TRS configuration		TRS	.2.1 TDD
TCI state		TCI	.State.0
RMSI CORESET parameters	meters CR.3.1 TDD		3.1 TDD
Dedicated CORESET parameters			
		CCR	.3.1 TDD
OCNG Patterns		(	OP.1
SSB Configuration		SSI	3.1 FR2
SMTC Configuration		SI	MTC.1
Correlation Matrix and Antenna		1x	2 Low
Configuration			
EPRE ratio of PSS to SSS			
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS	dB	0	0
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMRS to SSS(Note			
1)			
EPRE ratio of OCNG to OCNG DMRS (Note 1)			
Propagation Condition		AWGN	AWGN
Note 1: OCNG shall be used such that bot	h cells are ful		L

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

Table A.7.5.6.1.1.1-4: OTA related test parameters for BWP switching test caseParameter	Unit	Cell 1	Cell 2
Angle of arrival configuration		Setup 1 defined in clause A.3.15.1	Setup 1 defined in clause A.3.15.1
$N_{oc}^{}$ Note1	dBm/15kHz	-112	-112
$N_{oc}^{}$ Note1	dBm/SCS	-103	-103
SS-RSRP <sup>Note2</sup>	dBm/SCS Note3	-85	-85
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	18	18
Io <sup>Note4</sup>	dBm/95.04 MHz <sup>Note4</sup>	-56	-56

- Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.
- Note 2: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
- Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone.

#### A.7.5.6.1.1.2 Test Requirements

During T1, the UE shall start to send the ACK for PSCell in the DL slot right after DL slot  $(i+T_{BWPswitchDelav}+kI)$ .

During T3, the UE shall start to send the ACK for PSCell in the DL slot right after DL slot  $(j+T_{BWPswitchDelav}+kI)$ .

Where, k1 is the timing between DL data receiving and acknowledgement as specified in [7].

Depending on UE capability *bwp-SwitchingDelay* [2], UE shall finish BWP switch within the time duration  $T_{BWPswitchDelay}$  defined in Table 8.6.2-1.

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch delay to be counted as correct.

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

During T1 and T3, the start time of SCell interruption during PCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of SCell shall not be longer than the interruption duration specified for active BWP switch in clause 8.2.2.2.5.

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch interruption to be counted as correct.

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

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK in the DL slot right after DL slot (i+YI), (j+Y2), then the UE shall use the next available uplink resource for reporting the corresponding ACK.

# A.7.5.6.1.2 NR FR1- NR FR2 DL active BWP switch of PCell with non-DRX in SA

# A.7.5.6.1.2.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement defined in clause 8.6, and interruption requirement on other active serving cell defined in clause 8.2.2.2.5.

The supported test configurations are shown in Table A.7.5.6.1.2.1-1 below. The test scenario comprises of one NR PCell (Cell 1) and one NR SCell (Cell 2). The general parameters are given in Table A.7.5.6.1.2.1-2. NR Cell-specific parameters are specified in Table A.7.5.6.1.2.1-3 below. OTA related test parameters are shown in table A.7.5.6.1.2.1-4 below.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 1 and the time duration of T2.

PDCCHs indicating new transmissions shall be sent continuously on SCell (Cell 2) to ensure that the UE will have ACK/NACK sending.

Before the test starts,

UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), and Cell 2 (SCell) on radio channel 2 (SCC).

UE is configured with 2 different UE-specific downlink bandwidth parts for PCell, BWP-1 and BWP-2, in Cell 1 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.

UE is indicated in firstActiveDownlinkBWP-Id that the active DL BWP is BWP-1 in PCell.

UE is configured with a bwp-InactivityTimer timer value for PCell.

All cells have constant signal levels throughout the test.

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

During T1,

Time period T1 starts when a DCI format 1\_1 command for PCell DL BWP switch, sent from the test equipment to the UE, is received at the UE side in PCell's slot # denoted i. The UE shall switch its bandwidth part from BWP-1 to BWP-2.

The UE shall be able to receive PDSCH no later than at the beginning of the DL slot right after PCell's DL slot  $(i+T_{BWPswitchDelay})$  as defined in clause 8.6 and starts to report valid ACK/NACK for the PCell no later than at the beginning of the DL slot right after slot  $(i+T_{BWPswitchDelay}+kI)$ . The UE shall be continuously scheduled on PCell's BWP-2 no later than the beginning of the DL slot right after slot  $(i+T_{BWPswitchDelay})$ .

The starting time of SCell (Cell 2) interruption due to BWP switch on PCell shall occur within the BWP switch delay.

During T2, the test equipment won't transmit DCI format for PDSCH reception on PCell(Cell 1).

During T3,

The time period T3 starts from the slot #j, where j is the beginning slot of the DL subframe immediately after the slot wherein *bwp-InactivityTimer* timer expires. The UE should switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1.

The UE shall be able to receive PDSCH no later than the beginning of the DL slot right after PCell's DL slot  $(j+T_{BWPswitchDelay})$  as defined in clause 8.6 and starts to report valid ACK/NACK for the PSCell at latest at the beginning of the DL slot right after slot  $(j+T_{BWPswitchDelay}+kI)$ . The UE shall be continuously scheduled on PSCell's BWP-1 no later than the beginning of the DL slot right after slot  $(j+T_{BWPswitchDelay})$ .

The starting time of SCell (Cell 2) interruption due to BWP switch of PCell shall occur within the BWP switch delay.

The test equipment verifies the DL BWP switch time in PCell by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK is received.

The test equipment verifies that potential interruption to SCell is carried out in the correct time span by monitoring ACK/NACK sent in SCell during BWP switch of PCell, respectively.

Table A.7.5.6.1.2.1-1: DL BWP switch supported test configurations

Config	Description			
1	PCell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode			
	SCell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode			
2	PCell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode			
	SCell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode			
3	PCell: NR 30 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode			
	SCell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode			
Note 1: The UE is only required to be tested in one of the supported test configurations				

Table A.7.5.6.1.2.1-2: General test parameters for DL BWP switch in SA

Parameter	Unit	Value	Comment
NR RF Channel Number		2	Two NR radio channel is used for this test
Active PCell		Cell 1	PCell on RF channel number 1.
Active SCell		Cell 2	SCell on RF channel number 2.
CP length		Normal	
DRX		OFF	For both PCell and PSCell
bwp-InactivityTimer	ms	200	
Cell-individual offset for cells	dB	0	Individual offset for cells on PCC.
on RF channel number 1	uВ	Ŭ	
Cell-individual offset for cells on RF channel number 2	dB	0	Individual offset for cells on PSCC.
Cell2 timing offset to cell1			Time alignment error as specified in TS
Celiz tilling onset to celi i	μS	3	38.104 [13] clause 6.5.3.1.
T4		0.0	36.104 [13] clause 6.3.3.1.
T1	S	0.2	
T2	S	0.2	
T3	S	0.2	

Table A6.5.6.1.2.1-3: NR Cell specific test parameters for DL BWP switch in SA

Parameter		Unit	Cell 1	Cell2
Frequency Range			FR1	FR2
Duplex mode	Config 1		FDD	TDD
	Config 2,3		TDD	100
TDD configuration	Config 1		Not Applicable	
	Config 2		TDDConf.1.1	TDDConf.3.1
	Config 3		TDDConf.2.1	
BW <sub>channel</sub>	Config 1,2	MHz	10 MHz: N <sub>RB,c</sub> = 52	100 MHz: N = 66
	Config 3		40 MHz: N <sub>RB,c</sub> = 106	100 MHz: $N_{RB,c} = 66$
Active BWP ID			1, 2	3
Downlink initial BWP			DLBW	
Uplink initial BWP Co			ULBW	P.0.2
Downlink active BWF	P-1 Configuration		DLBWP.1.3	-
Downlink active BWI	P-2 Configuration		DLBWP.1.3	-
Uplink active BWP-1	Configuration		DLBWP.1.3	-
Uplink active BWP-2	Configuration		DLBWP.1.3	-
PDSCH Reference	Config 1		SR.1.1 FDD	SR.3.1 TDD
measurement	Config 2		SR.1.1 TDD	
channel	Config 3		SR.2.1 TDD	
RMSI CORESET	Config 1		CR.1.1 FDD	
parameters	Config 2	CR.1.1 TDD		CR.3.1 TDD
•	Config 3	1	CR.2.1 TDD	
Dedicated	Config 1		CCR.1.1 FDD	
CORESET	Config 2		CCR.1.1 TDD	CCR.3.1 TDD
parameters	Config 3		CCR.2.1 TDD	
OCNG Patterns	<u> </u>		OP	<u>'.1</u>
SSB Configuration	Config 1,2		SSB.1 FR1	SSB.1 FR2
· ·	Config 3		SSB.2 FR1	
TRS configuration	Config 1,2,3		-	TRS.2.1 TDD
TCI state	Config 1,2,3		TCI.State.0	TCI.State.0
SMTC Configuration			SMT	
Correlation Matrix an	d Antenna		NA	1x2 Low
Configuration			Link only, see clause A.3.7A	
EPRE ratio of PSS to				
EPRE ratio of PBCH				
EPRE ratio of PBCH		]		
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS		dB	0	0
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS(Note				
1) EPRE ratio of OCNG to OCNG DMRS		-		
	10 OCNG DIMKS			
(Note 1) Propagation Conditio	n		NA NA	AWGN
Fropagation Conditio	II		Link only, see clause A.3.7A	AVVGIN
Nata 1. OCNO aba		<u> </u>	Link only, see clause A.3.7A	

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

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

Note 3: SS-RSRP and SCH\_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table A.7.5.6.1.2.1-4: OTA related test parameters for BWP switching test case

Parameter	Unit	Cell 1	Cell 2
Angle of arrival configuration		NA	Setup 1 defined in clause A.3.15.1
$N_{oc}^{ m Note1}$	dBm/15kHz		-112
$N_{oc}^{ m Note1}$	dBm/SCS		-103
SS-RSRP <sup>Note2</sup>	dBm/SCS Note3	NA Link only, see clause A.3.7A	-85
$\hat{E}_{s}/I_{ot}$	dB	A.S.//A	18
Io <sup>Note4</sup>	dBm/95.04 MHz <sup>Note4</sup>		-56

- Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.
- Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the guiet zone
- Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone.

#### A.7.5.6.1.2.2 Test Requirements

During T1, the UE shall start to send the ACK for PSCell in the DL slot right after DL slot  $(i+T_{BWPswitchDelav}+kI)$ .

During T3, the UE shall start to send the ACK for PSCell in the DL slot right after DL slot  $(j+T_{BWPswitchDelav}+kI)$ .

Where, k1 is the timing between DL data receiving and acknowledgement as specified in [7].

Depending on UE capability *bwp-SwitchingDelay* [2], UE shall finish BWP switch within the time duration  $T_{BWPSwitchDelay}$  defined in Table 8.6.2-1.

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch delay to be counted as correct.

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

During T1 and T3, the start time of SCell interruption during PCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of SCell shall not be longer than the interruption duration specified for active BWP switch in clause 8.2.2.2.5.

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch interruption to be counted as correct.

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

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK in the DL slot right after DL slot (i+YI), (j+Y2), then the UE shall use the next available uplink resource for reporting the corresponding ACK.

# A.7.5.6.1.3 NR FR2 DL active BWP switch with non-DRX in SA

#### A.7.5.6.1.3.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement defined in clause 8.6. Supported test configurations are shown in Table A.7.5.6.1.3.1-1.

The test scenario comprises of one NR cell (Cell 1) as given in Table A.7.5.6.1.3.1-2. Cell-specific parameters of NR PCell is specified in Table A.7.5.6.1.3.1-3 below. The OTA related test parameters for FR2 is shown in Table A.7.5.6.1.3.1-4.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 on radio channel 1.
- UE is configured with 2 different UE-specific downlink bandwidth parts, BWP-1 and BWP-2 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1.
- UE is configured with a *bwp-InactivityTimer* timer value for Cell1.

All cells have constant signal levels throughout the test.

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

During T1,

Time period T1 starts when a DCI format 1\_1 command for DL BWP switch, sent from the test equipment to the UE, is received at the UE side in Cell 1's slot # denoted i. The UE should switch its bandwidth part from BWP-1 to BWP-2.

The UE shall be able to receive PDSCH at the beginning of the DL slot right after Cell 1's DL slot  $(i+T_{BWPswitchDelay})$  as defined in clause 8.6 and starts to report valid ACK/NACK for the Cell 1 no later than at the beginning of the DL slot right after slot  $(i+T_{BWPswitchDelay}+kI)$ . The UE shall be continuously scheduled on Cell 1's BWP-2 starting from the beginning of the DL slot right after slot  $(i+T_{BWPswitchDelay})$ .

During T2, the test equipment won't transmit DCI format for PDSCH reception on Cell 1.

#### During T3,

The time period T3 starts from the slot #j, where j is the beginning slot of the DL subframe immediately after the slot wherein *bwp-InactivityTimer* timer expires. The UE should switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1.

The UE shall be able to receive PDSCH at the beginning of the DL slot right after Cell 1's DL slot  $(j+T_{BWPswitchDelay})$  as defined in clause 8.6 and starts to report valid ACK/NACK for the Cell 1 at latest at the beginning of the DL slot right after slot  $(j+T_{BWPswitchDelay}+kI)$ . The UE shall be continuously scheduled on Cell 1's BWP-1 starting from the beginning of the DL slot right after slot  $(j+T_{BWPswitchDelay})$ .

The test equipment verifies the DL BWP switch time by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK is received.

Table A.7.5.6.1.3.1-1: DL BWP switch supported test configurations

	Config	Description				
	1	NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode				
Note 1:	Void.					
Note 2:	2: A UE which fulfils the requirements in test case A.7.5.6.1.1 or A.7.5.6.1.2 can skip the test cases in					
	A.7.5.6.1.3.					

Table A.7.5.6.1.3.1-2: General test parameters for DL BWP switch in SA

Parameter	Unit	Value	Comment
NR RF Channel Number		1	One NR radio channel is used for this test
Active Cell		Cell 1	Cell on RF channel number 1.
CP length		Normal	
DRX		OFF	For both PCell and PSCell
bwp-InactivityTimer	ms	[200]	
T1	S	[0.2]	
T2	S	[0.2]	
T3	S	[0.2]	

Table A7.5.6.1.3.1-3: NR Cell specific test parameters for DL BWP switch in SA

Parameter	Unit	Cell 1		
Frequency Range		FR2		
Duplex mode		TDD		
TDD configuration		TDDConf.3.1		
BW <sub>channel</sub>		100 MHz: N <sub>RB,c</sub> = 66		
Active BWP ID		1, 2		
Initial DL BWP Configuration		DLBWP.0.2 Note 2		
Active DL BWP-1 Configuration		DLBWP.1.1 Note 2		
Active DL BWP-2 Configuration		DLBWP.1.3 Note 2		
Initial UL BWP Configuration		ULBWP.0.2 Note 2		
Active UL BWP-1 Configuration		ULBWP.1.1 Note 2		
Active UL BWP-2 Configuration		ULBWP.1.3 Note 2		
PDSCH Reference measurement channel		SR.3.1 TDD		
RMSI CORESET parameters		CR.3.1 TDD		
Dedicated CORESET parameters		CCR.3.1 TDD		
OCNG Patterns		OP.1		
SSB Configuration		SSB.1 FR2		
SMTC Configuration		SMTC.1		
TCI State		TCI.State.0		
TRS Configuration		TRS.2.1 TDD		
Correlation Matrix and Antenna		1x2 Low		
Configuration				
EPRE ratio of PSS to SSS	dB	0		
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS(Note 1)				
EPRE ratio of OCNG to OCNG DMRS (Note	]			
1)				
Propagation Condition		AWGN		
Note 1: OCNG shall be used such that the cell is fully allocated and a constant total				
transmitted power spectral density is achieved for all OFDM symbols.				
Note 2: For unpaired spectrum, a DL RWP is linked with an LIL RWP, DLRWP 0.2 is				

Note 2: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3].

Table A7.5.6.1.3.1-4: OTA related test parameters for DL BWP switch in SA

Parameter		Unit	Cell 2		
Angle of	arrival configuration		Setup 1 defined in		
			clause A.3.15.1		
N <sub>oc</sub> Note 1		dBm/15			
		kHz	-112		
Noc <sup>Note 1</sup>		dBm/SCS	-103		
SS-RSR	P Note 2	dBm/120 kHz <sup>Note3</sup>	-85		
Ê <sub>s</sub> /I <sub>ot</sub>		dB	18		
Ês/Noc No	ote 5	dB	18		
Io <sup>Note2</sup>		dBm/95.04	-56		
		MHz Note4	-50		
Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N₀c to be fulfilled.					
Note 2:					
Note 3:	· · · · · · · · · · · · · · · · · · ·				
Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone					
Note 5:	Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone.				

## A.7.5.6.1.3.2 Test Requirements

During T1, the UE shall start to send the ACK for Cell 1 in the DL slot right after slot  $(i+T_{BWPswitchDelay}+kI)$ .

During T3, the UE shall start to send the ACK for Cell 1 in the DL slot right after slot  $(j+T_{BWPswitchDelav}+kI)$ .

Where, k1 is the timing between DL data receiving and acknowledgement as specified in [7].

Depending on UE capability *bwp-SwitchingDelay* [2], UE shall finish BWP switch within the time duration  $T_{BWPSwitchDelay}$  defined in Table 8.6.2-1.

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch delay to be counted as correct.

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

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK in the DL slot right after slot ( $i + T_{BWPswitchDelay} + kI$ ), ( $j + T_{BWPswitchDelay} + kI$ ), then the UE shall use the next available uplink resource for reporting the corresponding ACK.

#### A.7.5.6.2 RRC-based Active BWP Switch

# A.7.5.6.2.1 NR FR2 DL active BWP switch of PCell with non-DRX in SA

# A.7.5.6.2.1.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement for RRC-based BWP switch defined in clause 8.6.3. Supported test configurations are shown in Table A.7.5.6.2.1.1-1.

The test scenario comprises of one NR PCell (Cell 1) as given in Table A.7.5.6.2.1.1-2. Cell-specific parameters of NR PCell are specified in Table A.7.5.6.2.1.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC).
- UE has bandwidth part BWP-1 in its RRC-configuration for Cell 1 (PCell).
- UE is indicated in firstActiveDownlinkBWP-Id that the active DL BWP is BWP-1 in PCell.

All cells have constant signal levels throughout the test.

The test consists of 1 time period, with duration of T1.

# During T1,

Time period T1 starts when a *RRCReconfiguration* with updated bandwidth part configuration, sent from the test equipment to the UE, is received at the UE side in PSCell's slot # denoted i. The UE shall reconfigure its bandwidth part with the updated bandwidth part configuration.

The UE shall be able to completely receive PDSCH at the beginning of the DL slot right after PSCell's DL slot  $(i+T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC})$  as defined in clause 8.6.3 and be ready for the reception of uplink grant for the PSCell no later than at the beginning of the DL slot right after slot  $(i+T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC})$ . The UE shall be continuously scheduled on PSCell's BWP-1 starting from the beginning of the DL slot right after slot  $(i+T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC})$ .

 $T_{RRCprocessingDelay}$  and  $T_{BWPswitchDelayRRC}$  are defined in clause 8.6.3.

The test equipment verifies the DL BWP switch time in PSCell by counting the time from the time when the RRC Reconfiguration message including updated BWP configuration is sent till the time when RRC Reconfiguration Complete message is received.

Table A.7.5.6.2.1.1-1: DL BWP switch supported test configurations

Config	Config Description	
1	NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode	
2	NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode	
Note 1: The UE is only required to be tested in one of the supported test configurations		

Table A.7.5.6.2.1.1-2: General test parameters for DL BWP switch in synchronous EN-DC

Parameter	Unit	Value	Comment
NR RF Channel Number		1	One NR radio channel is used for this test
Active PCell		Cell 1	PCell on RF channel number 1.
CP length		Normal	
DRX		OFF	
Cell-individual offset for cells on RF channel number 1	dB	0	Individual offset for cells on PCC.
T1	s	[0.2]	

Table A.7.5.6.2.1.1-3: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC

Pa	rameter	Unit	Cell 1		
Frequency Range			FR2		
Duplex mode			TDD		
TDD configuration			TDDConf.3.1		
BW <sub>channel</sub>			100 MHz: N <sub>RB,c</sub> = 66		
Active BWP ID			1		
Initial DL BWP Cor	nfiguration		DLBWP.0.2		
Initial UL BWP Configuration			ULBWP.0.2		
Initial Condition	ndition Active DL BWP-1		DLBWP.1.3		
	Configuration				
	Active UL BWP-1		ULBWP.1.3		
	Configuration				
Final	Active DL BWP-1		DLBWP.1.1		
Condition	Configuration				
	Active UL BWP-1		ULBWP.1.1		
	Configuration				
	measurement channel		SR.3.1 TDD		
RMSI CORESET p			CR.3.1 TDD		
Dedicated CORES	ET parameters		CCR.3.1 TDD		
OCNG Patterns			OP.1		
SSB Configuration			SSB.1 FR2		
SMTC Configuration	n		SMTC.1		
TCI State			TCI.State.0		
TRS Configuration			TRS.2.1 TDD		
Antenna Configuration			1x2		
Propagation Condition			AWGN		
EPRE ratio of PSS to SSS		dB	0		
EPRE ratio of PBCH					
EPRE ratio of PBCH					
EPRE ratio of PDCCI					
EPRE ratio of PDSCI	H DMRS to SSS				
EPRE ratio of PDSCI	H to PDSCH				
	DMRS to SSS(Note 1)				
	to OCNG DMRS (Note 1)				
			y allocated and a constant		
			red for all OFDM symbols.		
Note 2: Interference from other cells and noise sources not specified in the test is					
assumed to be constant over subcarriers and time and shall be modelled					
	as AWGN of appropriate power for N₀c to be fulfilled.				
	information purposes. They are not settable parameters themselves.  Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2				
Note 4: For unpaired spectrum, a DL BWP is lin is linked with ULBWP.0.2; DLBWP.1.1 i					
	The state of the s		· ·		
	DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213				
[3].					

Table A.7.5.6.2.1.1-4: OTA related test parameters for BWP switching test case

Parameter		Unit	Cell 2
Angle of arrival configuration			According to table A.3.15
	NR_TDD_FR2_A		
	NR_TDD_FR2_B		
$N_{oc}^{ m Note1}$	NR_TDD_FR2_F	dBm/15kHz	-112
	NR_TDD_FR2_G	UDIII/ IOKHZ	-112
	NR_TDD_FR2_T		
	NR_TDD_FR2_Y		

$N_{oc}^{$		NR_TDD_FR2_A NR_TDD_FR2_B NR_TDD_FR2_F NR_TDD_FR2_G	dBm/SCS	-103		
		NR TDD FR2 T	-			
		NR TDD FR2 Y	1			
		NR_TDD_FR2_A				
		NR_TDD_FR2_B				
SS-RSRI	Note2	NR_TDD_FR2_F	dBm/SCS	-85		
33-KSKI		NR_TDD_FR2_G	Note3			
		NR_TDD_FR2_T				
		NR_TDD_FR2_Y				
		NR_TDD_FR2_A				
		NR_TDD_FR2_B				
Io <sup>Note2</sup>		NR_TDD_FR2_F	dBm/95.04	-56		
		NR_TDD_FR2_G	MHz Note4			
		NR_TDD_FR2_T				
		NR_TDD_FR2_Y				
Note 1:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.					
Note 2:	SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.					
Note 3:	SS-RSRP	S-RSRP minimum requirements are specified assuming independent erference and noise at each receiver antenna port.				
Note 4:	Equivalent quiet zone	Equivalent power received by an antenna with 0 dBi gain at the centre of the				

## A.7.5.6.2.1.2 Test Requirements

During T1, the UE shall be ready for the reception of uplink grant for PCell in the beginning of the DL slot right after slot ( $i+T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC}$ ).

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch delay to be counted as correct.

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

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

# A.7.5.7 PSCell addition and release delay

# A.7.5.7.1 Addition and Release Delay of known NR PSCell

### A.7.5.7.1.1 Test Purpose and Environment

The purpose of this test is to verify the PSCell addition and release delay requirements defined in clauses 8.9.2 and 8.9.3, respectively, for the case where the PSCell is known to the UE at the time of addition.

The supported test configurations are given in Table A.7.5.7.1.1-1. The test scenario comprises two NR cells, Cell 1 and Cell 2, on radio channel 1 in FR1 and radio channel 2 in FR2, respectively. Test parameters are given in Tables A.7.5.7.1.1-2 and A.7.5.7.1.1-3 below. The test consists of five time periods with durations T1, T2, T3, T4 and T5, respectively.

At the start of T1, the UE shall be connected to Cell 1 (PCell) on radio channel 1 (PCC) and shall only monitor PCC and hence be unaware of Cell 2 (PSCell-to-be) on radio channel 2. Before the start of T2, the test system shall send measurement control information including measurement gap configuration and event-triggered reporting configuration for measurements on radio channel 2.

During T2, the UE shall identify Cell 2 and send an event-triggered report. When the tests system receives the report, it shall send updated measurement control information where the measurement gap pattern is released. Before the start of T3, the test system shall send a RRC message instructing the UE to add PSCell (Cell 2), and further instructing the UE to report CSI periodically in the PSCell once it has been added. Reception by the UE of this RRC message defines the start of T3.

During T3, the UE shall carry out random access towards the PSCell. Reception by the test system of the PRACH preamble defines the start of T4.

During T4, the UE shall send periodic CSI reports in PSCell. After having received at least one such report, the test system shall send a RRC message instructing the UE to release the PSCell. Reception by the UE of the RRC message defines the start of T5.

During T5, the UE shall release the PSCell.

Table A.7.5.7.1.1-1: Supported test configurations for FR2 PSCell

Config	Description	
1	FR1 FDD SSB SCS 15kHz BW 10MHz – FR2 TDD SSB SCS 240kHz BW 100MHz	
2	FR1 TDD SSB SCS 15kHz BW 10MHz – FR2 TDD SSB SCS 240kHz BW 100MHz	
3	FR1 TDD SSB SCS 30kHz BW 40MHz – FR2 TDD SSB SCS 240kHz BW 100MHz	
Note 1: The UE is only required to be tested in one of the supported test configurations		

Table A.7.5.7.1.1-2: General test parameters for PSCell addition and release delay

	Parameter Unit Value		Comment	
RF Cha	nnel Number		1, 2	Two radio channels are used for this test
Active F	PCell		Cell 1	PCell on RF channel number 1 in FR1
Neighbo	our cell		Cell 2	Neighbour cell (PSCell-to-be) on RF channel number 2 in FR2
A4	Hysteresis	dB	0	Hysteresis for event A4
	Threshold RSRP	dBm	-97	Threshold for event A4
	Time to Trigger	S	0	Time to trigger for event A4
DRX			OFF	For both PCell and PSCell once activated
Measur	ement gap pattern ID		0	Gaps are configured before T2 and released before T3.
PRACH	l configuration in Cell 2		FR2 PRACH configuration 2	PRACH configuration as specified in Clause A.3.8.3.2.
	orting periodicity and onfiguration for Cell 2	ms	[2]	
T1		S	5	During this time the PCell is known and Cell 2 is unknown.
T2		S	1	During this time the UE shall identify neighbour cell 2 and report event B1.
T3		S	1	During this time the UE adds the PSCell.
T4	T4 s 1		During this time the UE sends CSI reports for PSCell.	
T5	T5 s 1		During this time the UE releases the PSCell.	

Table A.7.5.7.1.1-3: NR Cell specific test parameters for PSCell addition and release delay

Parameter	Unit	Config	Cell 1		Cell2
				T1	T2 T3 T4 T5
Frequency Range		1,2,3	FR1		FR2
Duplex mode		1	FDD		TDD
		2,3	TDD		TDD
TDD configuration		1	-		
		2	TDDConf.1.1		TDDConf.3.1
		3	TDDConf.2.1		
BWchannel		1,2	10: N <sub>RB,c</sub> = 52		
	MHz	3	40: N <sub>RB,c</sub> = 106		100: $N_{RB,c} = 66$
Initial Downlink BWP configuration		1,2,3	DLBWP.0.1		DLBWP.0.1
Initial Uplink BWP configuration		1,2,3	ULBWP.0.1		ULBWP.0.1
Dedicated Downlink BWP configuration		1,2,3	DLBWP.1.1		DLBWP.1.1
Dedicated Downlink BWP configuration		1,2,3	ULBWP.1.1		ULBWP.1.1
PDSCH Reference Measurement		1,2,3	SR.1.1 FDD		OLDWF.1.1
Channel		2	SR.1.1 TDD		SR.3.1 TDD
Charlie		3	SR.2.1 TDD		3K.3.1 1DD
TRS configuration		1,2,3	3N.Z.1 1DD		TRS.2.1 TDD
TCI state			_		
RMSI CORESET parameters		1,2,3 1	CR.1.1 FDD		TCI.State.0
RIVISI CORESET parameters		2	CR.1.1 TDD		CR.3.1 TDD
		3	CR.1.1 TDD		CR.S.T TDD
Dedicated CORESET parameters			CCR.1.1 FDD		
Dedicated CORESET parameters		2			CCD 3.4 TDD
		3	CCR.1.1 TDD CCR.2.1 TDD		CCR.3.1 TDD
OCNG Patterns <sup>Note1</sup>		1,2,3	OP.1		OP.1
SSB configuration		1,2,3	SSB.1 FR1		
COD Cornigulation		3	SSB.2 FR1		SSB.2 FR2
SMTC configuration		1,2,3	SMTC.2		SMTC.1
Correlation Matrix and Antenna config		1,2,3	1x2 Low		1x2 Low
Angle of Arrival configuration		1,2,3			Setup 1
EPRE ratio of PSS to SSS		1,2,0			
EPRE ratio of PBCH DMRS to SSS					
EPRE ratio of PBCH to PBCH DMRS	1				
EPRE ratio of PDCCH DMRS to SSS					
EPRE ratio of PDCCH to PDCCH DMRS	dB	1,2,3	0		0
EPRE ratio of PDSCH DMRS to SSS	1	.,_,			· ·
EPRE ratio of PDSCH to PDSCH					
EPRE ratio of OCNG DMRS to SSS					
EPRE ratio of OCNG to OCNG DMRS	-				
Noc Note2	dBm/ 15kHz	1,2,3	-98	N/A	-98
Noc Note2		1,2	-98	NI/A	00
	dBm/SCS	3	-95	N/A	-89
Ês/lot	dB	1,2,3	5	-∞	5
Ês/Noc	dB	1,2,3	5	-∞	5
SS-RSRP <sup>Note3,4</sup>	dBm/SCS	1,2 3	-93 -90	N/A	-84
	dBm/ 9.36 MHz	1,2	-63.85	_	-
Io <sup>Note3,4</sup>	dBm/ 38.16 MHz	3	-57.76	_	-
	dBm/ 95.04 MHz	1,2,3	-	N/A	-53.82
Propagation Condition		1,2,3	AWGN	AWGN	

Note 1:	OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N₀c to be fulfilled.
Note 3:	SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves. SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 4:	Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone.

#### A.7.5.7.1.2 Test Requirements

The UE shall transmit the PRACH preamble to PSCell at latest [112] ms into T3.

The UE shall transmit at least one periodic CSI report for PSCell during T4.

The UE shall stop transmitting CSI reports for PSCell at latest [20] ms into T5.

All of the above test requirements shall be fulfilled in order for the observed PSCell addition and release delay to be counted as correct. The rate of correct events observed during repeated tests shall be at least 90%.

## A.7.5.7.2 Addition and Release Delay of unknown NR PSCell

## A.7.5.7.2.1 Test Purpose and Environment

The purpose of this test is to verify the PSCell addition and release delay requirements defined in clauses 8.9.2 and 8.9.3, respectively, for the case where the PSCell is unknown to the UE at the time of addition.

The supported test configurations are given in Table A.7.5.7.2.1-1. The test scenario comprises two NR cells, Cell 1 and Cell 2, on radio channel 1 in FR1 and radio channel 2 in FR2, respectively. Test parameters are given in Tables A.7.5.7.2.1-2 and A.7.5.7.2.1-3 below. The test consists of four time periods with durations T1, T2, T3 and T4, respectively.

At the start of T1, the UE shall be connected to Cell 1 (PCell) on radio channel 1 (PCC) and shall only monitor PCC and hence be unaware of Cell 2 (PSCell-to-be) on radio channel 2. At the end of T1, the test system shall send a RRC message instructing the UE to add PSCell (Cell 2), and further instructing the UE to report CSI periodically in the PSCell once it has been added. Reception by the UE of this RRC message defines the start of T2.

During T2, the UE shall identify PSCell and carry out random access towards the PSCell. Reception by the test system of the PRACH preamble defines the start of T3.

During T3, the UE shall send periodic CSI reports in PSCell. After having received at least one such report, the test system shall send a RRC message instructing the UE to release the PSCell. Reception by the UE of the RRC message defines the start of T4.

During T4, the UE shall release the PSCell.

Table A.7.5.7.2.1-1: Supported test configurations for FR2 PSCell

Config	Description	
1	FR1 FDD SSB SCS 15kHz BW 10MHz – FR2 TDD SSB SCS 240kHz BW 100MHz	
2	FR1 TDD SSB SCS 15kHz BW 10MHz – FR2 TDD SSB SCS 240kHz BW 100MHz	
3	FR1 TDD SSB SCS 30kHz BW 40MHz – FR2 TDD SSB SCS 240kHz BW 100MHz	
Note 1: The UE is only required to be tested in one of the supported test configurations		

Table A.7.5.7.2.1-2: General test parameters for PSCell addition and release delay

Parameter	Unit	Value	Comment
RF Channel Number		1, 2	Two radio channels are used for this test
Active PCell		Cell 1	PCell on RF channel number 1 in FR1
Neighbour cell		Cell 2	Neighbour cell (PSCell-to-be) on RF channel number 2 in FR2
DRX		OFF	For both PCell and PSCell once activated
PRACH configuration in Cell 2		FR2 PRACH configuration 2	PRACH configuration as specified in Clause A.3.8.3.2.
CSI reporting periodicity and offset configuration for Cell 2	ms	[2]	
T1	s	5	During this time the PCell is known and Cell 2 is unknown.
T2	S	1	During this time the UE adds the PSCell.
Т3	s	1	During this time the UE sends CSI reports for PSCell.
T4	S	1	During this time the UE releases the PSCell.

Table A.7.5.7.2.1-3: NR Cell specific test parameters for PSCell addition and release delay

Parameter	Unit	Config	Cell 1		Cell2
				T1	T2 T3 T4
Frequency Range		1,2,3	FR1		FR2
Duplex mode		1	FDD		TDD
		2,3	TDD		100
TDD configuration		1	_		
		2	TDDConf.1.1		TDDConf.3.1
		3	TDDConf.2.1		
BWchannel		1,2	10: N <sub>RB,c</sub> = 52		
	MHz	3	40: N <sub>RB,c</sub> = 106		100: N <sub>RB,c</sub> = 66
Initial Downlink BWP configuration		1,2,3	DLBWP.0.1		DLBWP.0.1
Initial Uplink BWP configuration		1,2,3	ULBWP.0.1		ULBWP.0.1
Dedicated Downlink BWP configuration		1,2,3	DLBWP.1.1		DLBWP.1.1
Dedicated Downlink BWP configuration		1,2,3	ULBWP.1.1		ULBWP.1.1
PDSCH Reference Measurement		1,2,3	SR.1.1 FDD		OLDWF.1.1
Channel		2	SR.1.1 TDD		SR.3.1 TDD
Charlie		3	SR.2.1 TDD		3K.3.1 1DD
TRS configuration		1,2,3	3N.Z.1 1DD		TRS.2.1 TDD
TCI state			_		
RMSI CORESET parameters		1,2,3 1	CR.1.1 FDD		TCI.State.0
RIVISI CORESET parameters		2	CR.1.1 TDD		CR.3.1 TDD
		3	CR.2.1 TDD		CR.S.T TDD
Dedicated CORESET parameters			CCR.1.1 FDD		
Dedicated CORESET parameters		2			CCD 2.1 TDD
		3	CCR.1.1 TDD CCR.2.1 TDD		CCR.3.1 TDD
OCNG Patterns <sup>Note1</sup>		1,2,3	OP.1		OP.1
SSB configuration		1,2,3	SSB.1 FR1		
COD Comiguration		3	SSB.2 FR1		SSB.2 FR2
SMTC configuration		1,2,3	SMTC.2		SMTC.1
Correlation Matrix and Antenna config		1,2,3	1x2 Low		1x2 Low
Angle of Arrival configuration		1,2,3	_		Setup 1
EPRE ratio of PSS to SSS		1,=,=			
EPRE ratio of PBCH DMRS to SSS					
EPRE ratio of PBCH to PBCH DMRS					
EPRE ratio of PDCCH DMRS to SSS					
EPRE ratio of PDCCH to PDCCH DMRS	dB	1,2,3	0		0
EPRE ratio of PDSCH DMRS to SSS	1	,,_,,			
EPRE ratio of PDSCH to PDSCH					
EPRE ratio of OCNG DMRS to SSS					
EPRE ratio of OCNG to OCNG DMRS					
N <sub>oc</sub> Note2	dBm/ 15kHz	1,2,3	-98	N/A	-98
N <sub>oc</sub> Note2	dBm/SCS	1,2	-98	N/A	-89
		3	-95	IN/A	
Ês/lot	dB	1,2,3	5	$-\infty$	5
Ês/Noc	dB	1,2,3	5	-∞	5
SS-RSRP <sup>Note3,4</sup>	dBm/SCS	1,2 3	-93 -90	N/A	-84
	dBm/ 9.36 MHz	1,2	-63.85	_	
Io <sup>Note3,4</sup>	dBm/ 38.16 MHz	3	-57.76	_	-
	dBm/ 95.04 MHz	1,2,3	_	N/A	-53.82
Propagation Condition		1,2,3	AWGN	AWGN	

Note 1:	OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral
	density is achieved for all OFDM symbols.
Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant over
	subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3:	SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not
	settable parameters themselves. SS-RSRP minimum requirements are specified assuming independent
	interference and noise at each receiver antenna port.
Note 4:	Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone.

#### A.7.5.7.2.2 Test Requirements

The UE shall transmit the PRACH preamble to PSCell at latest [572] ms into T2.

The UE shall transmit at least one periodic CSI report for PSCell during T3.

The UE shall stop transmitting CSI reports for PSCell at latest [20] ms into T4.

All of the above test requirements shall be fulfilled in order for the observed PSCell addition and release delay to be counted as correct. The rate of correct events observed during repeated tests shall be at least 90%.

# A.7.5.8 Active TCI state switch delay

#### A.7.5.8.1 MAC-CE based active TCI state switch

#### A.7.5.8.1.1 NR PCell FR2 active TCl state switch for a known TCl state

#### A.7.5.8.1.1.1 Test Purpose and Environment

The purpose of this test is to verify the active TCI state switch delay requirement defined in clause 8.10.3. Supported test configuration is shown in Table A.7.5.8.1.1.1-1.

The test scenario comprises of one NR PCell (Cell 1) as given in Table A.7.5.8.1.1.1-2. Cell-specific parameters of NR PCell are specified in Table A.7.5.8.1.1.1-3 below. The OTA related test parameters for FR2 are shown in Table A.7.5.8.1.1.1-4.

PDCCHs indicating new transmissions shall be sent continuously on PCell to ensure that the UE would have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC).
- UE is configured with 2 different TCI states for PCell, PDCCH TCI state 0 (QCL'd to SSB0) and TCIstate 1 (QCL'd to SSB1), in Cell 1 before starting the test.
- UE is indicated in TCI state 0 as the active PDCCH TCI state

The test consists of two time periods, T1 and T2. During T1 only SSB to which PDCCH-TCI-state0 is QCL'd is transmitted. At the beginning of T2, the SSB corresponding to TCI state 1 starts transmitting. The is UE configured to provide periodic L1-RSRP reports. In slot n which is within 1280ms of UE providing L1-RSRP report with results for both SSB0 and SSB1, UE receives a MAC-CE command indicating a switch to TCI state 1.

The test equipment verifies that UE can be scheduled on PCell on TCI state 0 till n+  $T_{HARQ}$  +3 ms +  $T_{first-SSB}$ . The test equipment also verifies the TCI state switch time in PCell by scheduling the UE on TCI state 1 after n+  $T_{HARQ}$  +3 ms +  $(T_{first-SSB} + T_{SSB-proc})$ .

Table A.7.5.8.1.1.1-1: Supported test configurations

Config	Description		
1	NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode		

Table A.7.5.8.1.1.1-2: General test parameters for TCI state switch

Parameter	Unit	Value	Comment
E-UTRA RF Channel		1	One E-UTRA radio channel is used for this
Number		ı	test
NR RF Channel Number		2	One NR radio channel is used for this test
Active PCell		Cell 1	PCell on RF channel number 1.
CP length		Normal	
DRX		OFF	
Cell-individual offset for cells	dB	0	Individual offset for cells on PCC.
on RF channel number 1	ם	0	
Cell-individual offset for cells	dB	0	Individual offset for cells on PSCC.
on RF channel number 2	3	,	
Cell2 timing offset to cell1	μS	3	Synchronous EN-DC
T1	S	[0.2]	
T2	S	[0.2]	

Table A.7.5.8.1.1.1-3: NR Cell specific test parameters for TCI state switch

Parameter	Unit	Cell 1
Frequency Range		FR2
Duplex mode		TDD
TDD configuration		TDDConf.3.1
BW <sub>channel</sub>		100 MHz: N <sub>RB,c</sub> = 66
Initial DL BWP Configuration		DLBWP.0.2
Dedicated DL BWP Configuration		DLBWP.1.1
Initial UL BWP Configuration		ULBWP.0.2
Dedicated UL BWP Configuration		ULBWP.1.1
PDSCH Reference measurement channel		SR.3.1 TDD
RMSI CORESET parameters		CR.3.1 TDD
Dedicated CORESET parameters		CCR.3.1 TDD
OCNG Patterns		OP.1
SSB Configuration		SSB.1 FR2
SMTC Configuration		SMTC.1
TCI State 0		TC. State.0
TCI State 1		TCI.State.1
TRS Configuration		TRS.2.1 TDD
Correlation Matrix and Antenna		1x2 Low
Configuration		
EPRE ratio of PSS to SSS	dB	0
EPRE ratio of PBCH DMRS to SSS		
EPRE ratio of PBCH to PBCH DMRS		
EPRE ratio of PDCCH DMRS to SSS		
EPRE ratio of PDCCH to PDCCH DMRS		
EPRE ratio of PDSCH DMRS to SSS		
EPRE ratio of PDSCH to PDSCH		
EPRE ratio of OCNG DMRS to SSS(Note 1)		
EPRE ratio of OCNG to OCNG DMRS (Note		
1)		
Propagation Condition		AWGN
Note 1: OCNG shall be used such that both	cells are ful	y allocated and a constant

total transmitted power spectral density is achieved for all OFDM symbols.

Table A.7.5.8.1.1.1-4: OTA related test parameters for TCI state switch

Parameter	Unit	Cell 1					
		SS	B0	SS	SB1		
		T1	T2	T1	T2		
Angle of arriva	ıl	Setup	3 Accordin	g to clause <i>i</i>	A.3.15.3		
configuration							
Noc <sup>Note 1</sup>	dBm/15 kHz		[-9	92.1]			
Noc <sup>Note 1</sup>	dBm/SCS		3-]	33.1]			
Ês/Noc	dB	1	1 1 -Infinity 1				
SS-RSRP Note	dBm/120 kHz Note3	-82.1	-82.1 -82.1 -Infinity		-82.1		
Io <sup>Note2</sup>	dBm/95.04 MHz Note4	-54.9	-54.9	-54.9	-54.9		
Note 1: Inte	rference from other cells and	d noise sourc	es not spec	cified in the	test is		
ass	umed to be constant over su	bcarriers and	I time and s	shall be mod	delled as		
AW	GN of appropriate power for	$N_{\text{oc}}$ to be fulf	illed.				
Note 2: SS-	RSRP and lo levels have be	en derived fr	om other p	arameters fo	or		
info	rmation purposes. They are	not settable p	parameters	themselves	<b>3.</b>		
Note 3: SS-	RSRP minimum requiremen	ts are specifi	ed assumir	ng independ	ent		
inte	interference and noise at each receiver antenna port.						
-	uivalent power received by an antenna with 0 dBi gain at the centre of the						
•	et zone observed with 0dBi gain ante	nna at the co	ntor of the	quiot zono			

#### A.7.5.8.1.1.2 Test Requirements

During T2, UE shall send L1-RSRP report with results for both SSB0 and SSB1.

After receiving MAC-CE command in slot n, UE shall:

- be able to continue to receive on TCI state 0 till  $n+T_{HARQ}+3 ms+T_{first-SSB}$
- be able to start receiving on TCI state 1 after n+  $T_{HARQ}$  +5 ms + $TO_k$ \* $T_{first-SSB}$

#### A.7.5.8.2 RRC based active TCI state switch

#### A.7.5.8.2.1 NR PCell FR2 active TCI state switch for a known TCI state

## A.7.5.8.2.1.1 Test Purpose and Environment

The purpose of this test is to verify the active TCI state switch delay requirement defined in clause 8.10.3. Supported test configuration is shown in Table A.7.5.8.2.1.1-1.

The test scenario comprises of one NR PCell as given in Table A.7.5.8.2.1.1-2. Cell-specific parameters of NR PCell is specified in Table A.7.5.8.2.1.1-3 below. The OTA related test parameters for FR2 is shown in Table A.7.5.8.2.1.1-4.

PDCCHs indicating new transmissions shall be sent continuously on PCell to ensure that the UE would have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC).
- UE is configured with 1 TCI state for PCell, PDCCH-TCI-state0 (QCL'd to SSB0)
- UE is indicated in TCI state0 as the active TCI state

The test consists of two time periods, T1 and T2. During T1 only SSB to which TCI-state0 is QCL'd is transmitted. At the beginning of T2, the SSB corresponding to TCI-state0 starts transmitting. The is UE configured to provide periodic L1-RSRP reports. In slot n which is within 1280 ms of UE providing L1-RSRP report with results for both SSB0 and SSB1, UE receives a RRC command indicating a switch to TCI-state1.

The test equipment verifies the TCI state switch time in PCell by scheduling the UE on TCI state 1 after n+  $T_{RRC\_processing} + T_{first-SSB} + 2ms$ .

Table A.7.5.8.2.1.1-1: Supported test configurations

Config	Description			
1	NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode			

Table A.7.5.8.2.1.1-2: General test parameters for TCI state switch

Parameter	Unit	Value	Comment
NR RF Channel Number		1	One NR radio channel is used for this test
Active PCell		Cell 1	PCell on RF channel number 1.
CP length		Normal	
DRX		OFF	
Cell-individual offset for cells on RF channel number 1	dB	0	Individual offset for cells on PCC.
Cell-individual offset for cells on RF channel number 2	dB	0	Individual offset for cells on PSCC.
Cell2 timing offset to cell1	μS	3	Synchronous EN-DC
T1	S	[0.2]	
T2	S	[0.2]	

Table A.7.5.8.2.1.1-3: NR Cell specific test parameters for TCI state switch

Parameter	Unit	Cell 1
Frequency Range		FR2
Duplex mode		TDD
TDD configuration		TDDConf.3.1
BW <sub>channel</sub>		100 MHz: N <sub>RB,c</sub> = 66
Initial DL BWP Configuration		DLBWP.0.2
Dedicated DL BWP Configuration		DLBWP.1.1
Initial UL BWP Configuration		ULBWP.0.2
Dedicated UL BWP Configuration		ULBWP.1.1
PDSCH Reference measurement channel		SR.3.1 TDD
RMSI CORESET parameters		CR.3.1 TDD
Dedicated CORESET parameters		CCR.3.1 TDD
OCNG Patterns		OP.1
SSB Configuration		SSB.1 FR2
SMTC Configuration		SMTC.1
TCI State 0		TC. State.0
TCI State 1		TCI.State.1
TRS Configuration		TRS.2.1 TDD
Correlation Matrix and Antenna		1x2 Low
Configuration		
EPRE ratio of PSS to SSS	dB	0
EPRE ratio of PBCH DMRS to SSS		
EPRE ratio of PBCH to PBCH DMRS		
EPRE ratio of PDCCH DMRS to SSS		
EPRE ratio of PDCCH to PDCCH DMRS		
EPRE ratio of PDSCH DMRS to SSS		
EPRE ratio of PDSCH to PDSCH		
EPRE ratio of OCNG DMRS to SSS(Note 1)		
EPRE ratio of OCNG to OCNG DMRS (Note		
1)		
Propagation Condition		AWGN
Note 1: OCNG shall be used such that both	cells are full	y allocated and a constant

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

Table A.7.5.8.2.1.1-4: OTA related test parameters for TCI state switch

Parameter	Unit		C	ell 1	
		SS	B0	SSB1	
		T1	T2	T1	T2

Angle of configura		Setup 3 According to clause A.3.15.3					
N <sub>oc</sub> Note 1		dBm/15 kHz	[-92.1]				
N <sub>oc</sub> Note 1		dBm/SCS		 3-]	33.1]		
Ês/Noc		dB	1	1	-Infinity	1	
SS-RSR	P Note 2	dBm/120 kHz Note3	-82.1	-82.1	-Infinity	-82.1	
Io <sup>Note2</sup>		dBm/95.04 MHz Note4 -54.9 -54.9 -54.9 -54.9					
Note 1:	1: Interference from other cells and noise sources not specified in the test is						
	assume	d to be constant over sub	carriers and	I time and s	shall be mod	lelled as	
	AWGN (	of appropriate power for N	Noc to be fulf	illed.			
Note 2:	SS-RSR	P and lo levels have bee	n derived fr	om other pa	arameters fo	or	
	informat	ion purposes. They are n	ot settable p	parameters	themselves	·.	
Note 3:	SS-RSR	P minimum requirements	s are specifi	ed assumin	ig independ	ent	
	interference and noise at each receiver antenna port.						
Note 4:	Equivalent power received by an antenna with 0 dBi gain at the centre of the						
	quiet zo	ne					
Note 5:	As obse	ved with 0dBi gain anten	na at the ce	nter of the	quiet zone.		

#### A.7.5.8.2.1.2 Test Requirements

During T2, UE shall send L1-RSRP report with both SSB0 and SSB1.

After receiving RRC command in slot n, UE shall be able to start receiving on TCI state 1 after n+  $T_{RRC\_processing}$  +  $T_{first-SSB}$  + 2ms.

# A.7.6 Measurement procedure

# A.7.6.1 Intra-frequency Measurements

# A.7.6.1.1 SA event triggered reporting test without gap under non-DRX

#### A.7.6.1.1.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the TDD intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2. Supported test configurations are shown in table A.7.6.1.1.1-1.

Table A.7.6.1.1.1-1: supported test configurations

Configuration	Description
1	120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2	240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note: The UE is on	ly required to be tested in one of the supported test configurations.

There are two cells in the test, PCell (Cell 1) and a FR2 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for the Cell 1 and Cell 2 are given in Table A.7.6.1.1.1-2, A.7.6.1.1.1-3 and A.7.6.1.1.1-4 below.

In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

Table A.7.6.1.1.1-2: General test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 without gap without DRX

Parameter	Unit	Config	Value	Comment
Active cell		1, 2	PCell (Cell 1)	
Neighbour cell		1, 2	Cell 2	Cell to be identified.
RF Channel Number		1, 2	1: Cell 1 and	One TDD carrier frequency is used for the
		1, 2	Cell 2	NR cells.
SMTC configuration		1, 2	SMTC.1	
A3-Offset	dB	1, 2	-6	
CP length		1, 2	Normal	
Hysteresis	dB	1, 2	0	
Time To Trigger	S	1, 2	0	
Filter coefficient		1, 2	0	L3 filtering is not used
DRX		1, 2	OFF	
Time offset between Cell 1 and		1, 2	3 μs	Synchronous EN-DC
Cell 2		1, 2		
Time offset between Cell 2 and		1, 2	3 μs	Synchronous cells
Cell 3		1, 2		
T1	S	1, 2	5	
T2	S	1, 2	5	

Table A.7.6.1.1.1-3: NR Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 without gap without DRX

Parameter	Unit	Config	Ce	Cell 1		II 2
			T1 T2		T1	T2
TDD configuration		1, 2	TDDC	TDDConf.3.1 TDDConf.3.1		onf.3.1
Intial BWP		1, 2	DLBV	/P.0.1	DLBW	/P.0.1
configuration			ULBV	/P.0.1	ULBW	/P.0.1
Active DL BWP		1, 2	DLBV	/P.1.1	DLBW	/P.1.1
configuration						
Active UL BWP		1, 2	ULBV	/P.1.1	ULBW	/P.1.1
configuration						
RLM-RS		1, 2	SS	SB	SS	SB
PDSCH RMC		1, 2	SR.3.	SR.3.1 TDD		/A
configuration						
RMSI CORESET		1, 2	CR.3.	CR.3.1 TDD		1 TDD
RMC						
configuration						
Dedicated		1, 2	CCR.3	.1 TDD	CCR.3	.1 TDD
CORESET RMC						
configuration						
TRS configuration		1, 2	TRS.2	1 TDD	N/	/A
PDSCH/PDCCH		1, 2	TCI.S	tate.2	N/	/A
TCI states						
OCNG Patterns		1, 2	OF	OP.1		P.1
SSB		1	SSB.1 FR2 SSB.1 FR2		1 FR2	
		2	SSB.2 FR2 SSB.2 FR		2 FR2	
Propagation	_	1, 2		AWGN		
Condition						

Table A.7.6.1.1.1-4: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 without gap without DRX

Parameter	Unit	Config	Ce	Cell 1		Cell 2		
			T1	T2	T1	T2		
AoA setup		1, 2	S	etup 3 defii	ned in A.3.1	5.3		
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	1, 2	4	4	-Infinity	8		
$N_{oc}$ Note 2	dBm/15 KHz	1, 2		-102				
$N_{oc}$ Note 2	dBm/SCS	1	-93					
1 voc		2		-90				
SS-RSRP	dBm/SCS	1	-89	-89	-Infinity	-85		
		<u>2</u>	-86	-86	-Infinity	-82		
$\hat{E}_s/N_{oc}$	dB	1, 2	4	4	-Infinity	8		
Io	dBm/95.04MHz	1, 2		-58.56 for AoA1; -58.56 for AoA1 -55.38 for AoA2 -55.38 for AoA2				

- Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.
- Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

#### A.7.6.1.1.2 Test Requirements

In the test, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 2.4s for a UE supporting power class 1,
- 1.44s for a UE supporting power class 2, 3 and 4

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.7.6.1.2 SA event triggered reporting test without gap under DRX

#### A.7.6.1.2.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the TDD intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2. Supported test configurations are shown in table A.7.6.1.2.1-1.

Table A.7.6.1.2.1-1: supported test configurations

Coi	nfiguration	Description				
1		120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode				
2		240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode				
Note:	The UE is only required to be tested in one of the supported test configurations.					

There are two cells in the test, PCell (Cell 1) and a FR2 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for the Cell 1 and Cell 2 are given in Table A.7.6.1.2.1-2  $\sim$  6.

In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

Table A.7.6.1.2.1-2: General test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 without gap with DRX

Parameter	Unit	Config	Value		Comment
			Test 1	Test 2	
Active cell		1, 2	PCell (Ce	ell 1)	
Neighbour cell		1, 2	Cell 2		Cell to be identified.
RF Channel Number		1, 2	1: Cell 1 a	and Cell 2	One TDD carrier frequency is used for the NR cells.
SMTC configuration		1, 2	SMTC.1		
A3-Offset	dB	1, 2	-6		
CP length		1, 2	Normal		
Hysteresis	dB	1, 2	0		
Time To Trigger	S	1, 2	0		
Filter coefficient		1, 2	0		L3 filtering is not used
DRX		1, 2	DRX.1	DRX.2	DRX related parameters are defined in
		1, 2			Table A.7.6.1.2.1-5
Time offset between Cell 1		1, 2	3 μs		Synchronous EN-DC
and Cell 2		1, 2			
Time offset between Cell 2		1, 2	3 μs		Synchronous cells
and Cell 3		1, 2			
T1	S	1, 2	5		
T2	S	1, 2	10	52	

Table A.7.6.1.2.1-3: NR Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 without gap with DRX

Parameter	Unit	Config	Cell 1	Cell 2
			T1 T2	T1 T2
TDD configuration		1, 2	TDDConf.3.1	TDDConf.3.1
Intial BWP		1, 2	DLBWP.0.1	DLBWP.0.1
configuration			ULBWP.0.1	ULBWP.0.1
Active DL BWP		1, 2	DLBWP.1.1	DLBWP.1.1
configuration				
Active UL BWP		1, 2	ULBWP.1.1	ULBWP.1.1
configuration				
RLM-RS		1, 2	SSB	SSB
PDSCH RMC		1, 2	SR.3.1 TDD	N/A
configuration				
RMSI CORESET		1, 2	CR.3.1 TDD	CR.3.1 TDD
RMC				
configuration				
Dedicated		1, 2	CCR.3.1 TDD	CCR.3.1 TDD
CORESET RMC				
configuration				
TRS configuration		1, 2	TRS.2.1 TDD	N/A
PDSCH/PDCCH		1, 2	TCI.State.2	N/A
TCI states				
OCNG Patterns		1, 2	OP.1	OP.1
SSB		1	SSB.1 FR2	SSB.1 FR2
		2	SSB.2 FR2	SSB.2 FR2
Propagation		1, 2	Α	WGN
Condition				

Table A.7.6.1.2.1-4: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 without gap with DRX

Parameter	Unit	Config	Ce	II 1	Cell 2	
			T1	T2	T1	T2
AoA setup		1, 2	Se	etup 1 defir	ned in A.3.1	5.1
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	1, 2	4	-1.46	-Infinity	-1.46
$N_{oc}$ Note 2	dBm/15 KHz	1, 2		-	98	
$N_{oc}$ Note 2	dBm/SCS	1	-89			
1 oc		2		-	-86	
SS-RSRP	dBm/SCS	1	-85	-85	-Infinity	-85
		2	-82	-82	-Infinity	-82
$\hat{E}_s/N_{oc}$	dB	1, 2	4	4	-Infinity	4
Io	dBm/95.04MHz	1	-54.56	-52.21	-54.56	-52.21

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period

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

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table A.7.6.1.2.1-5: Void

Table A.7.6.1.2.1-6: Void

#### A.7.6.1.2.2 Test Requirements

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 7.2s for a UE supporting power class 1,
- 4.32s for a UE supporting power class 2, 3 and 4

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 51.2s for a UE supporting power class 1,
- 30.72s for a UE supporting power class 2, 3 and 4

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.7.6.1.3 SA event triggered reporting test with per-UE gaps under non-DRX

#### A.7.6.1.3.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the TDD intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2. Supported test configurations are shown in table A.7.6.1.3.1-1.

Table A.7.6.1.3.1-1: supported test configurations

	Configuration	Description					
1		120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode					
2		240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode					
Note:	The UE is only required to be tested in one of the supported test configurations.						

There are two cells in the test, PCell (Cell 1) and a FR2 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for the Cell 1 and Cell 2 are given in Table A.7.6.1.3.1-2  $\sim$  4 below.

There are two BWPs configured in Cell 1, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 1. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

Table A.7.6.1.3.1-2: General test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 with per-UE gaps without DRX

Parameter	Unit	Config	Value	Comment
Active cell		1, 2	PCell (Cell 1)	
Neighbour cell		1, 2	Cell 2	Cell to be identified.
RF Channel Number		1, 2	1: Cell 1 and Cell 2	One TDD carrier frequency is used for the NR cells.
Gap type		1, 2	Per-UE gaps	
Measurement gap repitition periodicity	ms	1, 2	40	
Measurement gap length	ms	1, 2	6	
Measurement gap offset	ms	1, 2	39	
SMTC configuration		1, 2	SMTC.1	
CSI-RS parameters		1, 2	CSI-RS.3.2 TDD	
A3-Offset	dB	1, 2	-6	
CP length		1, 2	Normal	
Hysteresis	dB	1, 2	0	
Time To Trigger	S	1, 2	0	
Filter coefficient		1, 2	0	L3 filtering is not used
DRX		1, 2	OFF	
Time offset between Cell 1 and Cell 2		1, 2	3 μs	Synchronous EN-DC
Time offset between Cell 2 and Cell 3		1, 2	3 μs	Synchronous cells
T1	s	1, 2	5	
T2	S	1, 2	5	

Table A.7.6.1.3.1-3: NR Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 with per-UE gaps without DRX

Parameter	Unit	Config	Cell 1		Cell 2	
			T1	T2	T1	T2

TDD configuration	1, 2	TDDConf.3.1	TDDConf.3.1
Intial BWP	1, 2	DLBWP.0.1	DLBWP.0.1
configuration		ULBWP.0.1	ULBWP.0.1
Active DL BWP	1, 2	DLBWP.1.2	DLBWP.1.1
configuration			
Active UL BWP	1, 2	ULBWP.1.2	ULBWP.1.1
configuration			
RLM-RS	1, 2	CSI-RS	SSB
PDSCH RMC	1, 2	SR.3.1 TDD	N/A
configuration			
RMSI CORESET	1, 2	CR.3.1 TDD	CR.3.1 TDD
RMC			
configuration			
Dedicated	1, 2	CCR.3.1 TDD	CCR.3.1 TDD
CORESET RMC			
configuration			
TRS configuration	1, 2	TRS.2.1 TDD	N/A
PDSCH/PDCCH	1, 2	TCI.State.2	N/A
TCI states			
OCNG Patterns	1, 2	OP.1	OP.1
SSB	1	SSB.1 FR2	SSB.1 FR2
	2	SSB.2 FR2	SSB.2 FR2
Propagation	 1, 2	AV	VGN
Condition			

Table A.7.6.1.3.1-4: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 with per-UE gaps without DRX

Parameter	Unit	Config	Ce	Cell 1		II 2	
			T1	T2	T1	T2	
AoA setup		1, 2	S	etup 3 defi	ned in A.3.1	5.3	
$\hat{E}_{s}/I_{ot}$	dB	1, 2	4	4	-Infinity	8	
$N_{oc}$ Note 2	dBm/15 KHz	1, 2		-	102		
$N_{oc}$ Note 2	dBm/SCS	1	-93				
1 oc		2			-90		
SS-RSRP	dBm/SCS	1	-89	-89	-Infinity	-85	
		<u>2</u>	-86	-86	-Infinity	-82	
$\hat{E}_s/N_{oc}$	dB	1, 2	4	4	-Infinity	8	
Io	dBm/95.04MHz	1, 2		or AoA1; for AoA2	-58.56 fo -55.38 f	,	

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

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

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

#### A.7.6.1.3.2 Test Requirements

In the test, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 3.2s for a UE supporting power class 1,
- 1.92s for a UE supporting power class 2, 3 and 4

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.7.6.1.4 SA event triggered reporting test with per-UE gaps under DRX

#### A.7.6.1.4.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the TDD intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2. Supported test configurations are shown in table A.7.6.1.4.1-1.

Table A.7.6.1.4.1-1: supported test configurations

	Configuration	Description			
1		120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode			
2		240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode			
Note	The UE is only required to be tested in one of the supported test configurations.				

There are two cells in the test, PCell (Cell 1) and a FR2 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for the Cell 1 and Cell 2 are given in Table A.7.6.1.4.1-2, A.7.6.1.4.1-3 and A.7.6.1.4.1-4 below.

There are two BWPs configured in Cell 1, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 1. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

Table A.7.6.1.4.1-2: General test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 with per-UE gaps with DRX

Parameter	Unit	Config	Value		Comment
			Test 1	Test 2	

Active cell		1, 2	PCell (Cell	l 1)	
Neighbour cell		1, 2	Cell 2		Cell to be identified.
RF Channel Number		1, 2	1: Cell 1 and Cell 2		One TDD carrier frequency is used for the NR cells.
Gap type		1, 2	Per-UE ga	ıps	
Measurement gap repitition periodicity	ms	1, 2	40		
Measurement gap length	ms	1, 2	6		
Measurement gap offset	ms	1, 2	39		
SMTC configuration		1, 2	SMTC.1		
CSI-RS parameters		1, 2	CSI-RS.3.	2 TDD	
A3-Offset	dB	1, 2	-6		
CP length		1, 2	Normal		
Hysteresis	dB	1, 2	0		
Time To Trigger	S	1, 2	0		
Filter coefficient		1, 2	0		L3 filtering is not used
DRX		1, 2	DRX.1	DRX.2	DRX related parameters are defined in Table A.7.6.1.2.1-5
Time offset between Cell 1 and Cell 2		1, 2	3 μs		Synchronous EN-DC
Time offset between Cell 2 and Cell 3		1, 2	3 μs		Synchronous cells
T1	S	1, 2	5		
T2	s	1, 2	10	52	

Table A.7.6.1.4.1-3: NR Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 with per-UE gaps with DRX

Parameter	Unit	Config	Cell 1	Cell 1		Cell 2	
			T1 '	T2	T1	T2	
TDD configuration		1, 2	TDDConf.3	3.1	TDDC	TDDConf.3.1	
Intial BWP		1, 2	DLBWP.0	.1	DLBW	VP.0.1	
configuration			ULBWP.0	.1	ULBW	√P.0.1	
Active DL BWP		1, 2	DLBWP.1	.2	DLBW	/P.1.1	
configuration							
Active UL BWP		1, 2	ULBWP.1	.2	ULBW	/P.1.1	
configuration							
RLM-RS		1, 2	SCSI-RS	;	SS	SB	
PDSCH RMC		1, 2	SR.3.1 TD	D	N.	/A	
configuration							
RMSI CORESET		1, 2	CR.3.1 TD	D	CR.3.	1 TDD	
RMC							
configuration							
Dedicated		1, 2	CCR.3.1 TI	DD	CCR.3	.1 TDD	
CORESET RMC							
configuration							
TRS configuration		1, 2	TRS.2.1 TI	DD	N.	/A	
TCI state		1, 2	CSI-RS.Con	fig.0	N/	/A	
OCNG Patterns		1, 2	OP.1		OF	P.1	
SSB		1	SSB.1 FR	2	SSB.	1 FR2	
		2	SSB.2 FR	2	SSB.2	2 FR2	
Propagation		1, 2		AW	/GN	_	
Condition							

Table A.7.6.1.4.1-4: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for SA with TDD PCell in FR2 with per-UE gaps with DRX

Parameter	Unit	Config	Ce	II 1	Cell 2				
			T1	T2	T1	T2			
AoA setup		1, 2	S	etup 1 defii	ned in A.3.1	5.1			
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	1, 2	4	-Infinity	-1.46				
$N_{oc}$ Note 2	dBm/15 KHz	1, 2		-98					
$N_{oc}$ Note 2	dBm/SCS	1		-89					
1 voc		2	-86						
SS-RSRP	dBm/SCS	1	-85	-85	-Infinity	-85			
		2	-82	-82	-Infinity	-82			
$\hat{E}_s/N_{oc}$	dB	1, 2	4	4	-Infinity	4			
Io	dBm/95.04MHz	1	-54.56	-52.21	-54.56	-52.21			

- Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.
- Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table A.7.6.1.4.1-5: Void

Table A.7.6.1.4.1-6:Void

#### A.7.6.1.4.2 Test Requirements

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 7.2s for a UE supporting power class 1,
- 4.32s for a UE supporting power class 2, 3 and 4

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 51.2s for a UE supporting power class 1,
- 30.72s for a UE supporting power class 2, 3 and 4

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.7.6.2 Inter-frequency Measurements

# A.7.6.2.1 SA event triggered reporting tests For FR2 without SSB time index detection when DRX is not used (PCell in FR2)

#### A.7.6.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3.4.

n this test, there are two cells: NR cell 1 as PCell in FR2 on NR RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.7.6.2.1.1-1, A.7.6.2.1.1-2, and A.7.6.2.1.1-3.

In test 1 measurement gap pattern configuration #0 as defined in Table A.7.6.2.1.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table A.7.6.2.1.1-2 is provided for UE that supports per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 2. Otherwise it is only required to pass test 1.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

Supported test configurations are shown in table A.7.6.2.1.1-1.

Table A.7.6.2.1.1-1 SA event triggered reporting tests without SSB index reading for FR2-FR2

Config	Description
1	120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note 1: Void	

Table A.7.6.2.1.1-1: General test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection

Parameter	Parameter Unit Test Value		lue	Comment			
		configurati on	Test 1	Test 2			
NR RF Channel Number		Config 1	1, 2		Two FR1 NR carrier frequencies is used.		
Active cell		Config 1	NR cell 1 (Pcell)		NR cell 1 (Pcell)		NR Cell 1 is on NR RF channel number 1.
Neighbour cell		Config 1	NR cell 2		NR cell 2 is on NR RF channel number 2.		
Gap Pattern Id		Config 1	0	13	As specified in clause 9.1.2-1.		
Measurement gap offset		Config 1	39	39			
SMTC-SSB parameters		Config 1	SSB.3 FR2		As specified in clause A.3.10.2		
A3-Offset	dB	Config 1	[-30]				
Hysteresis	dB	Config 1	0				
CP length		Config 1	Normal				
TimeToTrigger	S	Config 1	0				
Filter coefficient		Config 1	0		L3 filtering is not used		
DRX		Config 1	OFF		DRX is not used		
AoA setup		Config 1	Setup 1		As specified in clause A.3.15		
Time offset between serving and neighbour cells		Config 1	3μs		Synchronous cells.		
T1	s	Config 1	5				
T2	s	Config 1	5.2 for PC1; 5.2 for PC1; 3.5 for other PC PC				

Table A.7.6.2.1.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection

Para	Parameter		Test	Cell 1		Cell 1		
		Unit	configuratio n	T1	T2	T1	T2	
NR RF Channe	el Number		Config 1	,	1	2		
Duplex mode			Config 1	TE	DD	TDD		
TDD configurat	tion		Config 1	TDDC	onf.3.1	TDD0	Conf.3.1	
BW <sub>channel</sub>		MHz	Config 1		RB,c = 66		I <sub>RB,c</sub> = 66	
BWP BW	1	MHz	Config 1		<sub>RB,c</sub> = 66		I <sub>RB,c</sub> = 66	
BWP configuration	Initial DL BWP			DLBW	/P.0.1	1	N/A	
	Initial UL BWP		Config 1	ULBW			N/A	
	Dedicated DL BWP Dedicated UL		Coming 1	DLBW	/P.1.1	١	N/A	
00NO D #	BWP		0 5 4	ULBW	/P.1.1	1	N/A	
OCNG Patterns A.3.2.1.1 (OP.	1)		Config 1	OF		С	P.1	
PDSCH Refere measurement of	channel		Config 1	SR.3.			-	
CORESET Ref			Config 1	CR.3.	1 TDD		-	
SMTC configur in A.3.11.1 and	A.3.11.2	kHz	Config 1	SM	TC.1	SMTC.1		
spacing	DSCH/PDCCH subcarrier pacing		Config 1	120		120		
TRS configurat			Config 1	TRS.2.1 TDD		N/A		
TCI configuration			Config 1	CSI-RS.	Config.0	N/A		
EPRE ratio of PSS to SSS  EPRE ratio of PBCH DMRS to SSS  EPRE ratio of PBCH to PBCH DMRS  EPRE ratio of PDCCH DMRS to SSS  EPRE ratio of PDCCH to PDCCH DMRS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH to PDSCH EPRE ratio of OCNG DMRS to SSS(Note 1)  EPRE ratio of OCNG to OCNG DMRS (Note 1)		dBm/15	Config 1	, (		1	0 N/A	
$N_{oc}^{}$ Note2		kHz Note5		IN/A				
$N_{oc}$ Note2		dBm/S CS Note4	Config 1	N/A			N/A	
SS-RSRP Note 3		dBm/S CS Note5	Config 1	-87	-87	-Infinity	-87	
$\hat{E}_{s}/I_{ot}$		dB	Config 1	N/A	N/A	-Infinity	N/A	
$\hat{E}_s/N_{oc}$		dB	Config 1	N/A	N/A	-Infinity	N/A	

Io <sup>Note3</sup>		dBm/95	Config 1	-58.01	-58.01	-Infinity	-58.01		
		.04	_			_			
		MHz							
		Note5							
Propagat	ion Condition		Config 1		A۱	WGN			
Note 1:	OCNG shall be used	such that b	ooth cells are ful	ly allocated a	and a consta	nt total trans	mitted power		
	spectral density is ac								
Note 2:	Interference from oth	er cells and	d noise sources	not specified	in the test is	s assumed to	be constant		
	over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be								
	fulfilled.								
Note 3:	SS-RSRP and lo leve	els have be	en derived from	other param	eters for info	ormation purp	ooses. They		
	are not settable para			·			•		
Note 4:	SS-RSRP minimum i	requiremen	ts are specified	assuming ind	dependent ir	iterference a	nd noise at		
	each receiver antenna port.								
Note 5:	Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone								
Note 6:	As observed with 0 dBi gain antenna at the centre of the quiet zone								

#### A.7.6.2.1.2 Test Requirements

In test 1 with per-UE gap and in test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

5120 for UE supporting power class 1, or

3200 for UE supporting other power class.

In test 1 and 2 UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.7.6.2.2 SA event triggered reporting tests For FR2 without SSB time index detection when DRX is used (PCell in FR2)

### A.7.6.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3.4.

n this test, there are two cells: NR cell 1 as PCell in FR2 on NR RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.7.6.2.2.1-1, A.7.6.2.2.1-2, and A.7.6.2.2.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.7.6.2.2.1-2 is provided for UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table A.7.6.2.2.1-2 is provided for UE that supports per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

Supported test configurations are shown in table A.7.6.2.2.1-1.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

Table A.7.6.2.2.1-1: SA event triggered reporting tests without SSB index reading for FR2-FR2

Config	Description						
1	120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode						
Note 1: Void.							

Table A.7.6.2.2.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection

Parameter	Unit	Test	Value			Comment	
		configurati	Test	Test	Test	Test	
		on	1	2	3	4	
NR RF Channel Number		Config 1		1,	2		Two FR1 NR carrier frequencies is used.
Active cell		Config 1	NR ce	II 1 (Pce	·II)		NR Cell 1 is on NR RF channel number 1.
Neighbour cell		Config 1	NR ce	II 2			NR cell 2 is on NR RF channel number 2.
Gap Pattern Id		Config 1	0		13		As specified in clause 9.1.2-1.
Measurement gap offset		Config 1	39		39		
SMTC-SSB parameters		Config 1	SSB.3	FR2			As specified in clause A.3.10.2
A3-Offset	dB	Config 1	-6				
Hysteresis	dB	Config 1	0				
CP length		Config 1	Norma	ıl			
TimeToTrigger	S	Config 1	0				
Filter coefficient		Config 1	0				L3 filtering is not used
DRX		Config 1	DRX .1	DRX .2	DRX .1	DRX .2	As specified in clause A.3.3
AoA setup		Config 1,2	Setu p 1	Setu p 3	Setu p 1	Setu p 3	As specified in clause A.3.15
Time offset between serving and neighbour cells		Config 1	3μs			Synchronous cells.	
T1	s	Config 1	5				
T2	S	Config 1	8 for PC1; 5 for othe r PC	82 for PC1; 52 for othe r PC	8 for PC1; 5 for othe r PC	82 for PC1; 52 for other PC	

Table A.7.6.2.2.1-3: Cell specific test parameters for CA inter-frequency event triggered reporting without SSB time index detection

Para	Parameter		Test	Cell 1		Cell 2	
			configuratio n	T1 T2		T1	T2
NR RF Channe	el Number		Config 1	1		2	
TDD configuration	tion		Config 1	TDDC	onf.3.1	TDDConf.3.1	
Duplex mode			Config 1	TD		TDD	
BW <sub>channel</sub>		MHz	Config 1	100: N <sub>F</sub>	$_{RB,c} = 66$	100: N	I <sub>RB,c</sub> = 66
BWP BW		MHz	Config 1		<sub>RB,c</sub> = 66		I <sub>RB,c</sub> = 66
BWP configuration	Initial DL BWP			DLBW	/P.0.1	I	N/A
	Initial UL BWP		Config 1	ULBW			N/A
	Dedicated DL BWP		Comig 1	DLBW	/P.1.1		N/A
	Dedicated UL BWP			ULBW	/P.1.1	I	N/A
OCNG Pattern A.3.2.1.1 (OP.	1)		Config 1	OF		C	)P.1
PDSCH Refere measurement			Config 1	SR.3.			-
CORESET Ref Channel			Config 1	CR.3.	1 TDD		-
SMTC configur in A.3.11.1 and			Config 1	SMT	ГС.1	SMTC.1	
PDSCH/PDCC spacing	H subcarrier	kHz	Config 1	120		120	
TRS configurat			Config 1	TRS.2.1 TDD			N/A
TCI configurati			Config 1	CSI-RS.	Config.0	N/A	
EPRE ratio of I							
to SSS EPRE ratio of I DMRS	PBCH to PBCH						
EPRE ratio of I to SSS	PDCCH DMRS						
EPRE ratio of I PDCCH DMRS	3		Config 1	(	)	0	
EPRE ratio of I to SSS							
EPRE ratio of I PDSCH							
EPRE ratio of 0 to SSS(Note 1)	)						
EPRE ratio of 0 OCNG DMRS							
$N_{oc}$ Note2		dBm/15 kHz Note5		-104.7		-1	04.7
$N_{oc}$ Note2		dBm/S CS Note4	Config 1	-95.7		-95.7	
SS-RSRP Note 3		dBm/S CS Note5	Config 1	-89.7	-89.7	-Infinity	-86.7
$\hat{E}_{s}/I_{ot}$		dB	Config 1	6	6	-Infinity	9

$\hat{E}_s/N_{oc}$	dB	Config 1	6	6	-Infinity	9	
Io <sup>Note3</sup>	dBm/95 .04 MHz Note5	Config 1	-59.7	-59.7	-66.7	-57.2	
Propagation Condition		Config 1	AWGN				

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled
- Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
- Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone

## A.7.6.2.2.2 Test Requirements

In test 1 with per-UE gap and in test 3 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

7680 for UE supporting power class 1, or

4800 for UE supporting other power class.

In test 2 with per-UE gap and in test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X2 ms from the beginning of time period T2, where X2 is

81920 for UE supporting power class 1, or

51200 for UE supporting other power class. In test 1, 2, 3 and 4 UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.7.6.2.3 SA event triggered reporting tests For FR2 with SSB time index detection when DRX is not used (PCell in FR2)

### A.7.6.2.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are two cells: NR cell 1 as PCell in FR2 on NR RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.7.6.2.3.1-1, A.7.6.2.3.1-2, and A.7.6.2.3.1-3.

In test 1 measurement gap pattern configuration #0 as defined in Table A.7.6.2.3.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table A.7.6.2.3.1-2 is provided for UE that supports per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 2. Otherwise it is only required to pass test 1.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

Supported test configurations are shown in table A.7.6.2.3.1-1.

Table A.7.6.2.3.1-1: SA event triggered reporting tests with SSB index reading for FR2-FR2

Config Description					
1	120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode				
Note 1: Void.					

Table A.7.6.2.3.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection

Parameter	Unit	Test	Value		Comment
		configurati on	Test 1	Test 2	
NR RF Channel		Config 1	1, 2		Two FR1 NR carrier frequencies is
Number					used.
Active cell		Config 1	NR cell 1 (Pce	ell)	NR Cell 1 is on NR RF channel number 1.
Neighbour cell		Config 1	NR cell 2		NR cell 2 is on NR RF channel number 2.
Gap Pattern Id		Config 1	0	13	As specified in clause 9.1.2-1.
Measurement gap offset		Config 1	39	39	
SMTC-SSB parameters		Config 1	SSB.3 FR2		As specified in clause A.3.10.2
A3-Offset	dB	Config 1	[-30]		
Hysteresis	dB	Config 1	0		
CP length		Config 1	Normal		
TimeToTrigger	S	Config 1	0		
Filter coefficient		Config 1	0		L3 filtering is not used
DRX		Config 1	OFF		DRX is not used
AoA setup		Config 1	Setup 1		As specified in clause A.3.15
Time offset between serving and neighbour cells		Config 1	3μs		Synchronous cells.
T1	S	Config 1	5		
T2	S	Config 1	7 for PC1; 4.5 for other PC	7 for PC1; 4.5 for other PC	

Table A.7.6.2.3.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection

Parameter		Unit	Test configuratio	Ce	II 1	Cell 2		
				T1 T2		T1 T2		
ND DE OI			n					
NR RF Channel Number			Config 1	1	1		2	
Duplex mode			Config 1	TDD		TDD		
TDD configuration			Config 1	TDDConf.3.1		TDDConf.3.1		
BWchannel		MHz	Config 1	100: N <sub>RB,c</sub> = 66		100: N <sub>RB,c</sub> = 66		
BWP BW		MHz	Config 1	100: N <sub>RB,c</sub> = 66 DLBWP.0.1		100: N <sub>RB,c</sub> = 66		
BWP configuration	Initial DL			DLBW	/P.0.1	l l	N/A	
	BWP Initial UL			ULBWP.0.1		N/A		
	BWP							
	Dedicated DL		Config 1	DLBWP.1.1		N/A		
	BWP							
	Dedicated UL		1	ULBWP.1.1		N/A		
	BWP							
OCNG Patterns defined in			Config 1					
A.3.2.1.1 (OP.1)				OP.1		OP.1		
PDSCH Reference			Config 1	SR.3.1 TDD		-		
measurement channel			Comig					
CORESET Reference			Config 1	CR.3.1 TDD		-		
Channel SMTC configuration defined								
SMTC configuration defined in A.3.11.1 and A.3.11.2			Config 1	SMTC.1		SMTC.1		
PDSCH/PDCCH subcarrier		kHz	Config 1	120		120		
spacing TRS configuration			Config 1	TRS.2.1 TDD		N/A		
TCI configuration			Config 1	CSI-RS.Config.0		N/A N/A		
EPRE ratio of PSS to SSS			Comign	001-110.	Cornig.o	'	N/A	
			-					
EPRE ratio of PBCH DMRS to SSS								
			-					
EPRE ratio of PBCH to PBCH DMRS				0				
EPRE ratio of PDCCH DMRS			1					
to SSS								
EPRE ratio of PDCCH to			1					
PDCCH DMRS			Config 1				0	
EPRE ratio of PDSCH DMRS								
to SSS			=					
EPRE ratio of PDSCH to								
PDSCH EPRE ratio of OCNG DMRS			-					
to SSS(Note 1)								
EPRE ratio of OCNG to			1					
OCNG DMRS (Note 1)								
$N_{oc}^{}$ Note2		dBm/15		N/A		1	N/A	
		kHz						
		Note5						
$N_{oc}$ Note2		dBm/S	Config 1	N/A		N/A		
		CS Note 4						
SS-RSRP Note 3	<u> </u>	Note4	Config 1	07	07	Infinity	07	
55-K5KP ****		dBm/S CS	Config 1	-87	-87	-Infinity	-87	
		Note5						
î /ı		dB	Config 1	N/A	N/A	N/A	N/A	
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$						'"'		
$\hat{E}_s/N_{oc}$		dB	Config 1	N/A	N/A	N/A	N/A	
$\mathbf{L}_{s} / IV_{oc}$						1		

Io <sup>Note3</sup>		dBm/95	Config 1	-58.01	-58.01	-Infinity	-58.01	
		.04				_		
		MHz						
		Note5						
Propagati	ion Condition		Config 1		A۱	WGN		
Note 1:	OCNG shall be used	such that b	oth cells are ful	y allocated a	and a consta	nt total trans	mitted power	
	spectral density is ac							
Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant						be constant	
	over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be							
	fulfilled.							
Note 3:	SS-RSRP and lo leve	els have be	en derived from	other param	eters for info	ormation purp	oses. They	
	are not settable para	meters the	nselves.				-	
Note 4:	SS-RSRP minimum requirements are specified assuming independent interference and noise at							
	each receiver antenna port.							
Note 5:	Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone							
Note 6:	As observed with 0 dBi gain antenna at the centre of the quiet zone							

#### A.7.6.2.3.2 Test Requirements

In test 1 with per-UE gap and in test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

6720 for UE supporting power class 1, or

4160 for UE supporting other power class. In test 1 and 2 UE is required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.7.6.2.4 SA event triggered reporting tests For FR2 with SSB time index detection when DRX is used (PCell in FR2)

#### A.7.6.2.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are two cells: NR cell 1 as PCell in FR2 on NR RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.7.6.2.4.1-1, A.7.6.2.4.1-2, and A.7.6.2.4.1-3.

In test 1&2 measurement gap pattern configuration #0 as defined in Table A.7.6.2.4.1-2 is provided for UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table A.7.6.2.4.1-2 is provided for UE that supports per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

Supported test configurations are shown in table A.7.6.2.4.1-1.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

Table A.7.6.2.4.1-1: SA event triggered reporting tests with SSB index reading for FR2-FR2

Config	Description					
1	120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode					
Note 1: Void.						

Table A.7.6.2.4.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection

Parameter	Unit	Test	Value			Comment	
		configurati	Test	Test	Test	Test	
		on	1	2	3	4	
NR RF Channel		Config 1	1, 2				Two FR1 NR carrier frequencies is
Number		_					used.
Active cell		Config 1	NR ce	II 1 (Pce	ell)		NR Cell 1 is on NR RF channel
							number 1.
Neighbour cell		Config 1	NR ce	II 2			NR cell 2 is on NR RF channel
					1		number 2.
Gap Pattern Id		Config 1	0		13		As specified in clause 9.1.2-1.
Measurement gap		Config 1	39		39		
offset							
SMTC-SSB parameters		Config 1	SSB.3	FR2			As specified in clause A.3.10.2
A3-Offset	dB	Config 1	-6				
Hysteresis	dB	Config 1	0				
CP length		Config 1	Norma	ıl			
TimeToTrigger	S	Config 1	0				
Filter coefficient		Config 1	0				L3 filtering is not used
DRX		Config 1	DRX	DRX	DRX	DRX	As specified in clause A.3.3
			.1	.2	.1	.2	
AoA setup		Config 1	Setu	Setu	Setu	Setu	As specified in clause A.3.15
			p 1	р3	p 1	p 3	
Time offset between		Config 1	3μs				Synchronous cells.
serving and neighbour							
cells			_				
T1	S	Config 1	5				
T2	S	Config 1	11	108	11	108	
			for	for	for	for	
			PC1;	PC1;	PC1;	PC1;	
			6.5	67	6.5	67	
			for	for	for	for	
			othe r PC	othe	othe	other PC	
			170	r PC	r PC	10	

Table A.7.6.2.4.1-3: Cell specific test parameters for CA inter-frequency event triggered reporting with SSB time index detection

Parameter		r Unit Tes		Cell 1		Cell 2	
			configuratio	T1	T2	T1	T2
			n				
NR RF Channe	NR RF Channel Number		Config 1	1		2	
Duplex mode	Duplex mode		Config 1	TDD		TDD	
TDD configura	TDD configuration		Config 1	TDDConf.3.1		TDDConf.3.1	
BW <sub>channel</sub>		MHz	Config 1	100: N <sub>RB,c</sub> = 66		100: N <sub>RB,c</sub> = 66	
BWP BW		MHz	Config 1	100: N <sub>RB,c</sub> = 66		100: N <sub>RB,c</sub> = 66 100: N <sub>RB,c</sub> =	
BWP configuration	Initial DL BWP		0 5 4	DLBWP.0.1		N/A	
Ŭ	Initial UL BWP		Config 1	ULBWP.0.1		N/A	

Dedicated DL BWP			DLBW	/P.1.1	1	N/A	
Dedicated UL BWP			ULBW	/P.1.1	1	N/A	
OCNG Patterns defined in A.3.2.1.1 (OP.1)		Config 1	OP.1		OP.1		
PDSCH Reference measurement channel		Config 1		1 TDD		-	
CORESET Reference Channel		Config 1	CR.3.	1 TDD		-	
SMTC configuration defined in A.3.11.1 and A.3.11.2		Config 1	SMT	ГС.1	SM	ITC.1	
PDSCH/PDCCH subcarrier spacing	kHz	Config 1		20		120	
TRS configuration		Config 1	TRS.2.	1 TDD		N/A	
TCI configuration		Config 1	CSI-RS.	Config.0	1	N/A	
EPRE ratio of PSS to SSS				<u> </u>			
EPRE ratio of PBCH DMRS to SSS							
EPRE ratio of PBCH to PBCH DMRS							
EPRE ratio of PDCCH DMRS to SSS							
EPRE ratio of PDCCH to PDCCH DMRS		Config 1	0		0		
EPRE ratio of PDSCH DMRS							
to SSS							
EPRE ratio of PDSCH to PDSCH							
EPRE ratio of OCNG DMRS to SSS(Note 1)							
EPRE ratio of OCNG to OCNG DMRS (Note 1)							
$N_{oc}^{}$ Note2	dBm/15 kHz Note5		-10	4.7	-104.7		
$N_{oc}^{}$ Note2	dBm/S CS Note4	Config 1	-95.7		-9	95.7	
SS-RSRP Note 3	dBm/S CS Note5	Config 1	-89.7	-89.7	-Infinity	-86.7	
$\hat{E}_{s}/I_{ot}$	dB	Config 1	6	6	-Infinity	9	
$\hat{E}_s/N_{oc}$	dB	Config 1	6	6	-Infinity	9	
Io <sup>Note3</sup>	dBm/95 .04 MHz	Config 1	-59.7	-59.7	-66.7	-57.2	
D	Note5	0 " 1			I I		
Propagation Condition		Config 1	AWGN				

Note 1:	OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant
	over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be
	fulfilled.
Note 3:	SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4:	SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5:	Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
Note 6:	As observed with 0 dBi gain antenna at the centre of the quiet zone

#### A.7.6.2.4.2 Test Requirements

In test 1 with per-UE gap and in test 3 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

10080 for UE supporting power class 1, or

6240 for UE supporting other power class.

In test 2 with per-UE gap and in test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X2 ms from the beginning of time period T2, where X2 is

107520 for UE supporting power class 1, or

66560 for UE supporting other power class. In test 1, 2, 3 and 4 UE is required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.7.6.2.5 SA event triggered reporting tests for FR2 without SSB time index detection when DRX is not used (PCell in FR1)

#### A.7.6.2.5.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 2 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.7.6.2.5.1-1, A.7.6.2.5.1-2, and A.7.6.2.5.1-3.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.7.6.2.5.1-2 is provided for a UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table A.7.6.2.5.1-2 is provided for UE that support per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 2. Otherwise it is only required to pass test 1.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

Supported test configurations are shown in table A.7.6.2.5.1-1.

Table A.7.6.2.5.1-1 SA event triggered reporting tests without SSB index reading for FR1-FR2

Config	Description of serving cell	Description of target cell				
1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	120 kHz SSB SCS,				
2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	100 MHz bandwidth, TDD				
3	NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode	duplex mode				
Note: The UE is only required to be tested in one of the supported test configurations						

Table A.7.6.2.5.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection

Parameter	Unit Test Value		Comment				
		configurati on	Test 1	Test 2			
NR RF Channel Number		Config 1,2,3	1, 2		Two NR carrier frequencies is used.		
Active cell		Config 1,2,3	NR cell 1 (Pce	ell)	NR Cell 1 is on NR RF channel number 1.		
Neighbour cell		Config 1,2,3	NR cell 2		NR cell 2 is on NR RF channel number 2.		
Gap Pattern Id		Config 1,2,3	0	13	As specified in clause 9.1.2-1.		
Measurement gap offset		Config 1,2,3	39	39			
SMTC-SSB parameters		Config 1	SSB.1 FR1		As specified in clause A.3.10.1		
on NR RF Channel 1		Config 2	SSB.1 FR1		As specified in clause A.3.10.1		
		Config 3	SSB.2 FR1		As specified in clause A.3.10.1		
SMTC-SSB parameters on NR RF Channel 2		Config 1,2,3	SSB.3 FR2		As specified in clause A.3.10.2		
offsetMO	dB	Config 1,2,3	6				
Hysteresis	dB	Config 1,2,3	0				
a4-Threshold	dBm	Config 1,2,3	[-120]				
CP length		Config 1,2,3	Normal				
TimeToTrigger	s	Config 1,2,3	0				
Filter coefficient		Config 1,2,3	0		L3 filtering is not used		
DRX		Config 1,2,3	OFF		DRX is not used		
AoA setup		Config 1,2	Setup 1		As specified in clause A.3.15		
Time offset between serving and neighbour cells		Config 1	3ms		3ms		Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		Config 2,3	3μs		Synchronous cells.		
T1	s	Config 1,2,3	5				
T2	S	Config 1,2,3	5.2 for PC1; 3.5 for other PC	5.2 for PC1; 3.5 for other PC			

Table A.7.6.2.5.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection

Parameter	Unit	Test	Cell 1		Cell 2		
		configuratio	T1	T1 T2		T2	
		n					
NR RF Channel Number		Config 1,2,3		1		2	
Duplex mode		Config 1	F	FDD		DD	
		Config 2,3	TDD		Т	DD	
TDD configuration		Config 1	Not Ap	plicable	TDDConf.3.		

		<u> </u>	Config 2	TDDConf.1.1	TDD	Conf.3.1
			Config 2	TDDConf.1.1		Conf.3.1
BW <sub>channel</sub>		MHz	Config 1	10: N <sub>RB,c</sub> = 52		N <sub>RB,c</sub> = 66
D V V channel		IVI□∠	Config 1	10: N <sub>RB,c</sub> = 52 10: N <sub>RB,c</sub> = 52		$N_{RB,c} = 66$
			Config 3	40: N <sub>RB,c</sub> = 106		NRB,c = 66
BWP BW		MHz	Config 3			$N_{RB,c} = 60$ $N_{RB,c} = 66$
סאר האא		IVI□∠	Config 1	10: N <sub>RB,c</sub> = 52		$N_{RB,c} = 66$
			Config 2	10: N <sub>RB,c</sub> = 52 40: N <sub>RB,c</sub> = 106		$N_{RB,c} = 66$
BWP	Initial DL		Coning 3	40: N <sub>RB,c</sub> = 106 DLBWP.0.1		N <sub>RB,c</sub> = 66 N/A
configuration	BWP			DLDVVP.U. I		N/A
	Initial UL BWP		Config 1,2,3	ULBWP.0.1		N/A
	Dedicated DL BWP		001111g 1,2,0	DLBWP.1.1		N/A
	Dedicated UL BWP			ULBWP.1.1		N/A
OCNG Pattern A.3.2.1.1 (OP.			Config 1,2,3	OP.1		)P.1
PDSCH Refere			Config 1	SR.1.1 FDD		-
measurement of			Config 2	SR.1.1 TDD		
				SR2.1 TDD		
CODECET D-4	foronco		Config 3			
CORESET Ref	erence		Config 1	CR.1.1 FDD		-
Channel			Config 2	CR.1.1 TDD		
OMTO "			Config 3	CR2.1 TDD		
SMTC configuration defined in A.3.11.1 and A.3.11.2			Config 1	SMTC.2	SN	ITC.2
		kHz	Config 2,3	SMTC.1	SMTC.1	
PDSCH/PDCC	PDSCH/PDCCH subcarrier		Config 1,2	15		120
spacing	spacing		Config 3	30		120
EPRE ratio of I	PSS to SSS					
EPRE ratio of I	PBCH DMRS					
	PBCH to PBCH					
EPRE ratio of I	PDCCH DMRS					
EPRE ratio of I			Config 1,2,3	0		0
EPRE ratio of I						
to SSS EPRE ratio of I						
PDSCH						
EPRE ratio of ( to SSS(Note 1)	)					
	EPRE ratio of OCNG to					
OCNG DMRS (Note 1)		dBm/15				
$N_{oc}$ Note2	$N_{oc}$ Note2					NA
<b>λ</b> 7		Note5 dBm/S	Config 1,2			NA
$N_{oc}$ Note2		CS Note4	Config 3	NA Link only, see clause		NA
SS-RSRP Note 3	i	dBm/S	Config 1,2	A.3.7A	-Infinity	-87
50-11011I		CS Note5	Config 3	7.0.77	-Infinity	-87
$\hat{E}_{s}/I_{ot}$		dB	Config 1,2,3		-Infinity	NA
$\mathbf{L}_{\mathrm{s}}/1_{\mathrm{ot}}$						

$\hat{E}_s/N_{oc}$	dB	Config 1,2,3	-Infinity	NA
Io <sup>Note3</sup>	dBm/9. 36MHz	Config 1,2	-	-
	dBm/38 .16MHz	Config 3	-	-
	dBm/95 .04 MHz Note5	Config 1,2,3	-Infinity	-58.01
Propagation Condition		Config 1,2,3		NGN

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled
- Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
- Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone

#### A.7.6.2.5.2 Test Requirements

In test 1 with per-UE gap and in test 2 with per-FR gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

5120 for UE supporting power class 1, or

3200 for UE supporting other power class.

In test 1 and 2 UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.7.6.2.6 SA event triggered reporting tests for FR2 without SSB time index detection when DRX is used (PCell in FR1)

#### A.7.6.2.6.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 2 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.7.6.2.6.1-1, A.7.6.2.6.1-2, and A.7.6.2.6.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.7.6.2.6.1-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table A.7.6.2.6.1-2 is provided for UE that support per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

Supported test configurations are shown in table A.7.6.2.6.1-1.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

Table A.7.6.2.6.1-1: SA event triggered reporting tests without SSB index reading for FR1-FR2

Config	Description of serving cell	Description of target cell						
1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	120 kHz SSB SCS,						
2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	100 MHz bandwidth, TDD						
3	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode	duplex mode						
Note: The UI	Note: The UE is only required to be tested in one of the supported test configurations							

Table A.7.6.2.6.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection

Parameter	Unit	Test		Va	lue		Comment
		configurati on	Test 1	Test 2	Test 3	Test 4	
NR RF Channel Number		Config 1,2,3	1, 2			Two NR carrier frequencies is used.	
Active cell		Config 1,2,3		II 1 (Pce	ell)		NR Cell 1 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3	NR ce	II 2			NR cell 2 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3	0		13		As specified in clause 9.1.2-1.
Measurement gap offset		Config 1,2,3	39		39		
SMTC-SSB parameters		Config 1	SSB.1	FR1			As specified in clause A.3.10.1
on NR RF Channel 1		Config 2	SSB.1				As specified in clause A.3.10.1
		Config 3	SSB.2	FR1			As specified in clause A.3.10.1
SMTC-SSB parameters on NR RF Channel 2		Config 1,2,3	SSB.3	FR2			As specified in clause A.3.10.2
offsetMO	dB	Config 1,2,3	6				
Hysteresis	dB	Config 1,2,3	0				
a4-Threshold	dBm	Config 1,2,3	[-120]				
CP length		Config 1,2,3	Norma	al			
TimeToTrigger	s	Config 1,2,3	0				
Filter coefficient		Config 1,2,3	0				L3 filtering is not used
DRX		Config 1,2,3	DRX .1	DRX .2	DRX .1	DRX .2	As specified in clause A.3.3
AoA setup		Config 1,2	Setu	Setu	Setu	Setu	As specified in clause A.3.15
			p 1	p 3	p 1	p 3	
Time offset between serving and neighbour cells		Config 1	3ms				Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		Config 2,3	3µs				Synchronous cells.
T1	s	Config 1,2,3	5				
T2	S	Config 1,2,3	8 for PC1; 5 for othe r PC	82 for PC1; 52 for othe r PC	8 for PC1; 5 for othe r PC	82 for PC1; 52 for other PC	

Table A.7.6.2.6.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection

Parameter	Unit	Test	Cell 1		C	ell 2	
		configuratio	T1	T1 T2		T2	
		n					
NR RF Channel Number		Config 1,2,3		1		2	
Duplex mode		Config 1	F	DD	-	TDD	
		Config 2,3	Т	DD	-	ΓDD	
TDD configuration		Config 1	Not Ap	plicable	TDD	Conf.3.1	
		Config 2	TDDConf.1.1		TDD	Conf.3.1	
		Config 3	TDDConf.2.1		TDD	Conf.3.1	
BW <sub>channel</sub>	MHz	Config 1	10: N <sub>F</sub>	<sub>RB,c</sub> = 52	100: I	$N_{RB,c} = 66$	

		1	Config 2	10: N <sub>RB,c</sub> = 52	100· N	I <sub>RB,c</sub> = 66
			Config 2	40: N <sub>RB,c</sub> = 52		$I_{RB,c} = 66$
BWP BW		MHz	Config 1	10: N <sub>RB,c</sub> = 52		$I_{RB,c} = 66$
DWI DW		1711 12	Config 2	10: N <sub>RB,c</sub> = 52		$I_{RB,c} = 66$
			Config 3	40: N <sub>RB,c</sub> = 106		$I_{RB,c} = 66$
BWP	Initial DL		Coming 5	DLBWP.0.1		V/A
configuration	BWP			DEBWY .0.1		
	Initial UL BWP		Config 1,2,3	ULBWP.0.1		N/A
	Dedicated DL BWP		Coming 1,2,3	DLBWP.1.1	I	N/A
	Dedicated UL BWP			ULBWP.1.1	ı	N/A
OCNG Pattern A.3.2.1.1 (OP.			Config 1,2,3	OP.1	c	)P.1
PDSCH Refere	ence		Config 1	SR.1.1 FDD		-
measurement of	channel		Config 2	SR.1.1 TDD		
			Config 3	SR2.1 TDD		
CORESET Ref	ference		Config 1	CR.1.1 FDD		_
Channel	10101100		Config 2	CR.1.1 TDD	1	_
Chamici			Config 3	CR2.1 TDD	1	
SMTC configur	ration defined		Cornig 3			
in A.3.11.1 and			Config 1	SMTC.2	SM	ITC.2
			Config 2,3	SMTC.1	SM	ITC.1
PDSCH/PDCC	H subcarrier	kHz	Config 1,2	15		120
spacing			Config 3	30		120
EPRE ratio of I	PSS to SSS					
	PBCH DMRS PBCH to PBCH					
	PDCCH DMRS					
to SSS EPRE ratio of I			Config 1,2,3	0		0
PDCCH DMRS EPRE ratio of I			001111g 1,2,0			O
to SSS						
EPRE ratio of I PDSCH						
EPRE ratio of to SSS(Note 1)	)					
EPRE ratio of OCNG DMRS						
$N_{oc}$ Note2		dBm/15 kHz			-1	04.7
		Note5 dBm/S	Config 1.2		-	05.7
$N_{oc}$ Note2		CS Note4	Config 1,2 Config 3			95.7 95.7
SS-RSRP Note 3	<u> </u>	dBm/S	Config 1,2	NIA	_Infinity	-86.7
JJ-NJKP		CS	Config 1,2	NA Link only, see clause	-Infinity -Infinity	-86.7
$\hat{E}_{s}/I_{ot}$		Note5 dB	Config 1,2,3	A.3.7A	-Infinity	9
$\frac{\hat{E}_s/\Gamma_{ot}}{\hat{E}_s/N_{oc}}$		dB	Config 1,2,3		-Infinity	9
Io <sup>Note3</sup>		dBm/9.	Config 1,2		_	-
10		36MHz	Coming 1,2		_	-

	dBm/38 .16MHz	Config 3	-	-
	dBm/95 .04 MHz Note5	Config 1,2,3	-66.7	-57.2
Propagation Condition		Config 1,2,3	A۱	WGN

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled
- Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
- Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone

#### A.7.6.2.6.2 Test Requirements

In test 1 with per-UE gap and in test 3 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

7680 for UE supporting power class 1, or

4800 for UE supporting other power class.

In test 2 with per-UE gap and in test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X2 ms from the beginning of time period T2, where X2 is

81920 for UE supporting power class 1, or

51200 for UE supporting other power class.

In test 1, 2, 3 and 4 UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.7.6.2.7 SA event triggered reporting tests for FR2 with SSB time index detection when DRX is not used (PCell in FR1)

#### A.7.6.2.7.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3.4.

n this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 2 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.7.6.2.7.1-1, A.7.6.2.7.1-2, and A.7.6.2.7.1-3.

In test 1 measurement gap pattern configuration #0 as defined in Table A.7.6.2.7.1-2 is provided for a UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table A.7.6.2.7.1-2 is provided for UE that support per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 2. Otherwise it is only required to pass test 1.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

Supported test configurations are shown in table A.7.6.2.7.1-1.

Table A.7.6.2.7.1-1: SA event triggered reporting tests with SSB index reading for FR1-FR2

Config	Description of serving cell	Description of target cell
1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	120 kHz SSB SCS,
2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	100 MHz bandwidth, TDD
3	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode	duplex mode
Note: The U	E is only required to be tested in one of the supported test configura	tions

Table A.7.6.2.7.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection

Parameter	Unit	Test	Value		Comment		
		configurati on	Test 1	Test 2			
NR RF Channel Number		Config 1,2,3	1, 2		1, 2 		Two NR carrier frequencies is used.
Active cell		Config 1,2,3	NR cell 1 (Pce	ell)	NR Cell 1 is on NR RF channel number 1.		
Neighbour cell		Config 1,2,3	NR cell 2		NR cell 2 is on NR RF channel number 2.		
Gap Pattern Id		Config 1,2,3	0	13	As specified in clause 9.1.2-1.		
Measurement gap offset		Config 1,2,3	39	39			
SMTC-SSB parameters		Config 1	SSB.1 FR1		As specified in clause A.3.10.1		
on NR RF Channel 1		Config 2	SSB.1 FR1		As specified in clause A.3.10.1		
		Config 3	SSB.2 FR1		As specified in clause A.3.10.1		
SMTC-SSB parameters on NR RF Channel 2		Config 1,2,3	SSB.3 FR2		As specified in clause A.3.10.2		
offsetMO	dB	Config 1,2,3	6				
Hysteresis	dB	Config 1,2,3	0				
a4-Threshold	dBm	Config 1,2,3,4,5,6	[-120]				
CP length		Config 1,2,3	Normal				
TimeToTrigger	S	Config 1,2,3	0				
Filter coefficient		Config 1,2,3	0		L3 filtering is not used		
DRX		Config 1,2,3	OFF		DRX is not used		
AoA setup		Config 1,2	Setup 1		As specified in clause A.3.15		
Time offset between serving and neighbour cells		Config 1	3ms		Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.		
		Config 2,3	3μs		Synchronous cells.		
T1	S	Config 1,2,3	5				
T2	S	Config 1,2,3	7 for PC1; 4.5 for other PC	7 for PC1; 4.5 for other PC			

Table A.7.6.2.7.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection

Para	meter	Unit	Test	Cel		Cell 2		
			configuratio n	T1	T2	T1	T2	
NR RF Channe	el Number		Config 1,2,3	1			2	
Duplex mode			Config 1	FD	D	-	ΓDD	
			Config 2,3	TD			ΓDD	
TDD configura	tion		Config 1	Not App			Conf.3.1	
			Config 2	TDDC		TDDConf.3.1		
			Config 3	TDDC			Conf.3.1	
BW <sub>channel</sub>		MHz	Config 1	10: N <sub>RE</sub>			N <sub>RB,c</sub> = 66	
			Config 2	10: NRE			N <sub>RB,c</sub> = 66	
DIA/D DIA/		N 41 1	Config 3	40: N <sub>RB</sub>	c = 106	100: 1	N <sub>RB,c</sub> = 66	
BWP BW		MHz	Config 1	10: NRE		100: 1	N <sub>RB,c</sub> = 66	
			Config 2	10: N <sub>RE</sub>			N <sub>RB,c</sub> = 66	
BWP	Initial DL		Config 3	40: N <sub>RB</sub>			N <sub>RB,c</sub> = 66	
configuration	BWP			DLBW	P.U. I		N/A	
	Initial UL BWP		Config 1 2 2	ULBW	P.0.1		N/A	
	Dedicated DL BWP		- Config 1,2,3	DLBW	P.1.1		N/A	
	Dedicated UL BWP			ULBW	/P.1.1	N/A		
OCNG Pattern A.3.2.1.1 (OP.			Config 1,2,3	OF	 P.1		DP.1	
PDSCH Refere			Config 1	SR.1.1			-	
measurement			Config 2	SR.1.1				
			Config 3	SR2.1		-		
CORESET Re	ference		Config 1			_		
Channel	CICIOC		Config 2	CR.1.1 FDD CR.1.1 TDD		1	_	
Onarmo.			Config 3	CR2.1		1		
SMTC configur	ration defined							
in A.3.11.1 and			Config 1	SMT	C.2	SN	/ITC.2	
			Config 2,3	SMT	C.1	SM	/ITC.1	
PDSCH/PDCC	H subcarrier	kHz	Config 1,2	1:			120	
spacing			Config 3	3	0		120	
EPRE ratio of	PSS to SSS							
EPRE ratio of to SSS	PBCH DMRS		1					
	PBCH to PBCH		-					
	PDCCH DMRS		1					
EPRE ratio of PDCCH to			1					
PDCCH DMRS			Config 1,2,3	C	)		0	
EPRE ratio of to SSS	PDSCH DMRS							
	EPRE ratio of PDSCH to							
EPRE ratio of to SSS(Note 1								
EPRE ratio of			1					
OCNG DMRS								

$N_{oc}$ Note2	dBm/15 kHz				NA
$N_{oc}$ Note2	Note5 dBm/S CS Note4	Config 1,2 Config 3			NA NA
SS-RSRP Note 3	dBm/S CS Note5	Config 1,2 Config 3		-Infinity -Infinity	-87 -87
$\hat{E}_s/I_{ot}$	dB	Config 1,2,3	NA NA	-Infinity	NA
$\hat{E}_s/N_{oc}$	dB	Config 1,2,3	Link only, see clause A.3.7A	-Infinity	NA
Io <sup>Note3</sup>	dBm/9. 36MHz	Config 1,2		-	-
	dBm/38 .16MHz	Config 3		-	-
	dBm/95 .04 MHz Note5	Config 1,2,3		Infinity	-58.01
Propagation Condition		Config 1,2,3		A۱	NGN

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled
- Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the guiet zone
- Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone

#### A.7.6.2.7.2 Test Requirements

In test 1 with per-UE gap and in test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

6720 for UE supporting power class 1, or

4160 for UE supporting other power class.

In test 1 and 2 UE is required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.7.6.2.8 SA event triggered reporting tests for FR2 with SSB time index detection when DRX is used (PCell in FR1)

#### A.7.6.2.8.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 2 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.7.6.2.8.1-1, A.7.6.2.8.1-2, and A.7.6.2.8.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.7.6.2.8.1-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table A.7.6.2.8.1-2 is provided for UE that support per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

Supported test configurations are shown in table A.7.6.2.8.1-1.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

Table A.7.6.2.8.1-1: SA event triggered reporting tests with SSB index reading for FR1-FR2

Config	Description of serving cell	Description of target cell
1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	120 kHz SSB SCS,
2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	100 MHz bandwidth, TDD
3	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode	duplex mode
Note: The	UE is only required to be tested in one of the supported test configur	ations

Table A.7.6.2.8.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection

Parameter	Unit	Test		Value			Comment
		configurati on	Test 1	Test 2	Test 3	Test 4	
NR RF Channel Number		Config 1,2,3	1, 2			Two NR carrier frequencies is used.	
Active cell		Config 1,2,3		II 1 (Pce	ell)		NR Cell 1 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3	NR ce	II 2			NR cell 2 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3	0		13		As specified in clause 9.1.2-1.
Measurement gap offset		Config 1,2,3	39		39		
SMTC-SSB parameters		Config 1	SSB.1	FR1			As specified in clause A.3.10.1
on NR RF Channel 1		Config 2	SSB.1				As specified in clause A.3.10.1
		Config 3	SSB.2				As specified in clause A.3.10.1
SMTC-SSB parameters on NR RF Channel 2		Config 1,2,3	SSB.3				As specified in clause A.3.10.2
offsetMO	dB	Config 1,2,3	6				
Hysteresis	dB	Config 1,2,3	0				
a4-Threshold	dBm	Config 1,2,3	[-120]				
CP length		Config 1,2,3	Norma	al			
TimeToTrigger	s	Config 1,2,3	0				
Filter coefficient		Config 1,2,3	0				L3 filtering is not used
DRX		Config 1,2,3	DRX .1	DRX .2	DRX .1	DRX .2	As specified in clause A.3.3
AoA setup		Config 1,2	Setu p 1	Setu p 3	Setu p 1	Setu p 3	As specified in clause A.3.15
Time offset between serving and neighbour cells		Config 1	3ms				Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		Config 2,3	3μs				Synchronous cells.
T1	S	Config 1,2,3	5				
T2	s	Config 1,2,3	11 for PC1; 6.5 for othe r PCT BD	108 for PC1; 67 for othe r PCT BD	11 for PC1; 6.5 for othe r PCT BD	108 for PC1; 67 for other PCT BD	

Table A.7.6.2.8.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection

Parameter	Unit	Test	Cell 1		Cell 2		
		configuratio	T1 T2		T1	T2	
		n					
NR RF Channel Number		Config 1,2,3		1		2	
Duplex mode		Config 1	FI	FDD TDD		TDD	
		Config 2,3	TI	TDD		TDD	
TDD configuration		Config 1	Not Applicable		le TDDConf.3.1		
		Config 2	TDDC	onf.1.1	TDD	Conf.3.1	

			Config 3	TDDConf.2.1	TDD	Conf.3.1	
BWchannel		MHz	Config 1	10: N <sub>RB,c</sub> = 52		N <sub>RB,c</sub> = 66	
			Config 2	10: N <sub>RB,c</sub> = 52		N <sub>RB,c</sub> = 66	
			Config 3	40: N <sub>RB,c</sub> = 106		$I_{RB,c} = 66$	
BWP BW		MHz	Config 1	10: N <sub>RB,c</sub> = 52		√1 <sub>RB,c</sub> = 66	
			Config 2	10: N <sub>RB,c</sub> = 52		100: N <sub>RB,c</sub> = 66	
		<u></u>	Config 3	40: N <sub>RB,c</sub> = 106	100: N	N <sub>RB,c</sub> = 66	
BWP configuration	Initial DL BWP			DLBWP.0.1		N/A	
	Initial UL BWP		Config 1,2,3	ULBWP.0.1		N/A	
	Dedicated DL BWP		Oomig 1,2,3	DLBWP.1.1	ı	N/A	
	Dedicated UL BWP			ULBWP.1.1	ı	N/A	
OCNG Pattern A.3.2.1.1 (OP.	1)		Config 1,2,3	OP.1	c	)P.1	
PDSCH Refere	ence		Config 1	SR.1.1 FDD		-	
measurement of	channel		Config 2	SR.1.1 TDD			
			Config 3	SR2.1 TDD			
CORESET Ref	ference		Config 1	CR.1.1 FDD		-	
Channel			Config 2	CR.1.1 TDD			
			Config 3	CR2.1 TDD			
SMTC configur in A.3.11.1 and			Config 1	SMTC.2	SM	ITC.2	
			Config 2,3	SMTC.1	SN	ITC.1	
PDSCH/PDCC	H subcarrier	kHz	Config 1,2	15	,	120	
spacing			Config 3	30		120	
EPRE ratio of I	PSS to SSS						
EPRE ratio of I	PBCH DMRS						
EPRE ratio of I	PBCH to PBCH						
to SSS	PDCCH DMRS						
EPRE ratio of I	8		Config 1,2,3	0		0	
to SSS	PDSCH DMRS						
EPRE ratio of I PDSCH							
EPRE ratio of 0 to SSS(Note 1)	)						
EPRE ratio of 0							
$N_{oc}$ Note2		dBm/15 kHz Note5			-1	04.7	
<b>\</b> 17		dBm/S	Config 1,2		-9	95.7	
$N_{oc}$ Note2		CS Note4	Config 3	NA		95.7	
SS-RSRP Note 3	3	dBm/S	Config 1,2	Link only, see clause	-Infinity	-86.7	
·		CS Note5	Config 3	A.3.7A	-Infinity	-86.7	
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$		dB	Config 1,2,3		-Infinity	9	
$\hat{E}_s/N_{oc}$		dB	Config 1,2,3		-Infinity	9	
		l	l	l	l		

Io <sup>Note3</sup>	dBm/9. 36MHz	Config 1,2		-	-
	dBm/38 .16MHz	Config 3		-	-
	dBm/95	Config 1,2,3		-66.7	-57.2
	.04	001111g 1,2,0		00.1	01.2
	MHz				
	Note5				
Propagation Condition		Config 1,2,3		A۱	VGN

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{oc}$  to be fulfilled.
- Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
- Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone

#### A.7.6.2.8.2 Test Requirements

In test 1 with per-UE gap and in test 3 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

10080 for UE supporting power class 1, or

6240 for UE supporting other power class.

In test 2 with per-UE gap and in test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X2 ms from the beginning of time period T2, where X2 is

107520 for UE supporting power class 1, or

66560 for UE supporting other power class.

In test 1, 2, 3 and 4 UE is required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.7.6.3 L1-RSRP measurement for beam reporting

#### A.7.6.3.1 SSB based L1-RSRP measurement when DRX is not used

#### A.7.6.3.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5.4.1, with the testing configurations for NR cells in Table A.7.6.3.1.1-1.

The AoA setup for this test is Setup 1 as defined in clause A.3.15

Table A.7.6.3.1.1-1: Applicable NR configurations for FR2 SSB based L1-RSRP test

	Config	Description
1		NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2		NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note:	The UE is only i	required to be tested in one of the supported test configurations

#### A.7.6.3.1.2 Test parameters

There is one cells in the test, the FR2 PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.7.6.3.1.2-1 and Table A.7.6.3.1.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

Table A.7.6.3.1.2-1: General test parameters

Parameter	Config	Unit	Value
SSB GSCN	1~2		freq1
Duplex mode	1~2		TDD
TDD Configuration	1~2		TDDConf.3.1
BW <sub>channel</sub>	1~2	MHz	100: N <sub>RB,c</sub> = 66
PDSCH Reference measurement channel	1~2		SR.3.1 TDD
RMSI CORESET Reference Channel	1~2		CR.3.1 TDD
Dedicated CORESET Reference Channel	1~2		CCR.3.1 TDD
SSB configuration	1 2		SSB.1 FR2
OCNG Patterns	1~2		SSB.2 FR2 OP.1
OCING Patterns	1~2		DLBWP.0.1
Initial BWP Configuration	1~2		ULBWP.0.1
Dedicated BWP configuration	1~2		DLBWP.1.3 ULBWP.1.3
SMTC configuration	1~2		SMTC.1
TRS Configuration	1~2		TRS.2.1 TDD
PDCCH/PDSCH TCI	1~2		TCI.State.2
Configuration			TOI.State.2
DRX configuration	1~2		Off
reportConfigType	1~2		periodic
reportQuantity	1~2		ssb-Index-RSRP
Number of reported RS	1~2		2
L1-RSRP reporting period	1~2	slot	640
T1	1~2	S	5
T2	1~2	S	1
Propagation condition	1~2		AWGN
EPRE ratio of PSS to SSS  EPRE ratio of PBCH DMRS to SSS  EPRE ratio of PBCH to PBCH DMRS  EPRE ratio of PDCCH DMRS to SSS  EPRE ratio of PDCCH to PDCCH			
DMRS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH to PDSCH DMRS  EPRE ratio of OCNG DMRS to SSSNote 1  EPRE ratio of OCNG to OCNG	1~2	dB	0
DMRS Note 1	4.5		414/01:
Propagation condition	1~2		AWGN

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

Parameter	Config	Unit	SSI	B#0	SSB#1	
Parameter	Parameter Config Unit		T1	T2	T1	T2
Angle of arrival configuration			Setup 1 according to A.3.15.1			15.1
$N_{oc}$ Note2	1~2	dBm/15kHz		-1	05	
$N_{oc}^{ m Note2}$	1	dBm/SSB SCS		-6	96	
¹Voc	2 dBIII/SSB SCS		-93			
$\hat{\mathrm{E}}_{_{\mathrm{s}}}/\mathrm{I}_{_{\mathrm{ot}}}$	1~2	dB	0	0	-Infinity	9
SSB RSRP Note3	1	dBm/SSB SCS	-96	-96	-Infinity	-87
COBINON	2	dBiii/CCB CCC	-93	-93	-Infinity	-84
lo Note3	1	dD (OF, OANAL)-	-67.5	-67.5	-71.1	-60.7
10	2	dBm/95.04MHz	-67.5	-67.5	-71.1	-60.7
$\hat{E}_s/N_{oc}$	1~2	dB	0	0	-Infinity	9

Table A.7.6.3.1.2-2: SSB specific test parameters

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

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

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

#### A.7.6.3.1.3 Test Requirements

The UE shall send L1-RSRP report every 640 slots. No later than X ms plus 640 slots from the beginning of time period T2, UE shall send L1-RSRP report including the results for both SSB#0 and SSB#1 while meeting the accuracy requirements defined in clause 10.1.20.1, where X is

- 1680 for UE supporting power class 1
- 1200 for UE supporting power class 2,3 or 4.

The reported L1-RSRP value shall include the Rx antenna gain in the range of  $[-10 \sim +20]$  dB.

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

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.7.6.3.2 SSB based L1-RSRP measurement when DRX is used

#### A.7.6.3.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5.4.1, with the testing configurations for NR cells in Table A.7.6.3.2.1-1.

The AoA setup for this test is Setup 1 as defined in clause A.3.15

Table A.7.6.3.2.1-1: Applicable NR configurations for FR2 SSB based L1-RSRP test

	Config	Description
1		NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2		NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note:	The UE is only	required to be tested in one of the supported test configurations

#### A.7.6.3.2.2 Test parameters

There is one cells in the test, the FR2 PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.7.6.3.2.2-1 and Table A.7.6.3.2.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

Table A.7.6.3.2.2-1: General test parameters

Parameter	Config	Unit	Value
SSB GSCN	1~2		freq1
Duplex mode	1~2		TDD
TDD Configuration	1~2		TDDConf.3.1
BW <sub>channel</sub>	1~2	MHz	100: N <sub>RB,c</sub> = 66
PDSCH Reference measurement channel	1~2		SR.3.1 TDD
RMSI CORESET Reference Channel	1~2		CR.3.1 TDD
Dedicated CORESET Reference Channel	1~2		CCR.3.1 TDD
SSB configuration	1		SSB.1 FR2
	2		SSB.2 FR2
OCNG Patterns	1~2		OP.1
Initial BWP Configuration	1~2		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~2		DLBWP.1.3 ULBWP.1.3
SMTC configuration	1~2		SMTC.1
TRS Configuration	1~2		TRS.2.1 TDD
PDCCH/PDSCH TCI	1~2		TCI.State.2
Configuration	1~2		TCI.State.2
DRX configuration	1~2		DRX.3
reportConfigType	1~2		periodic
reportQuantity	1~2		ssb-Index-RSRP
Number of reported RS	1~2		2
L1-RSRP reporting period	1~2	slot	640
T1	1~2	S	5
T2	1~2	S	1
Propagation condition	1~2		AWGN
EPRE ratio of PSS to SSS EPRE ratio of PBCH DMRS to SSS EPRE ratio of PBCH to PBCH DMRS EPRE ratio of PDCCH DMRS to SSS EPRE ratio of PDCCH to PDCCH DMRS EPRE ratio of PDSCH DMRS to SSS	1~2	dB	0
EPRE ratio of PDSCH to PDSCH DMRS  EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup> EPRE ratio of OCNG to OCNG DMRS Note 1			
Propagation condition	1~2		AWGN

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

Parameter	Config	onfia Unit	SSI	B#0	SSB#1	
Parameter	Coming	Offic	T1	T2	T1	T2
Angle of arrival configuration			Setup 1 according to A.3.15.1			
$N_{oc}$ Note2	1~2	dBm/15kHz		-1	05	
$N_{oc}^{}$ Note2	1	dBm/SSB SCS		-6	96	
TV <sub>oc</sub>	2	dbiii/33b 3C3	-93			
$\hat{\mathrm{E}}_{_{\mathrm{s}}}/\mathrm{I}_{_{\mathrm{ot}}}$	1~2	dB	0	0	-Infinity	9
SSB RSRP Note3	1	dBm/SSB SCS	-96	-96	-Infinity	-87
	2		-93	-93	-Infinity	-84
lo Note3	1	dBm/95.04MHz	-67.5	-67.5	-71.1	-60.7
	2		-67.5	-67.5	-71.1	-60.7
$\hat{E}_s/N_{oc}$	1~2	dB	0	0	-Infinity	9

Table A.7.6.3.2.2-2: SSB specific test parameters

Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

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

Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

#### A.7.6.3.2.3 Test Requirements

The UE shall send L1-RSRP report every 640 slots. No later than X ms plus 640 slots from the beginning of time period T2, UE shall send L1-RSRP report including the results for both SSB#0 and SSB#1 while meeting the accuracy requirements defined in clause 10.1.20.1, where X is

- 2880 for UE supporting power class 1
- 1920 for UE supporting power class 2,3 or 4.

The reported L1-RSRP value shall include the Rx antenna gain in the range of  $[-10 \sim +20]$  dB.

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

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.7.6.3.3 CSI-RS based L1-RSRP measurement when DRX is not used

#### A.7.6.3.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5.4.2, with the testing configurations for NR cells in Table A.7.6.3.3.1-1.

Table A.7.6.3.3.1-1: Applicable NR configurations for FR2 CSI-RS based L1-RSRP test

	Config	Description
1		NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode
Note:	The UE is only re	equired to be tested in one of the supported test configurations

#### A.7.6.3.3.2 Test parameters

There is one cells in the test, the FR2 PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.7.6.3.3.2-1 and Table A.7.6.3.3.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the CSI-RS and report aperiodically. The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-RSRP on aperiodic CSI-RS resources. UE is also configured to measure L1-RSRP based on SSB. After 160ms from the beginning of the test, the DCI trigger comes in slot 8 of a frame and UE provides the report back based on the reporting configuration as defined in Table A.7.6.3.3.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM and BFD based on the SSBs.

Table A.7.6.3.3.2-1: General test parameters

Parameter	Config	Unit	Value
SSB GSCN	1		freq1
Duplex mode	1		TDD
TDD Configuration	1		TDDConf.3.1
BW <sub>channel</sub>	1	MHz	100: N <sub>RB,c</sub> = 66
PDSCH Reference measurement channel	1		SR.3.1 TDD
RMSI CORESET Reference Channel	1		CR.3.1 TDD
Dedicated CORESET Reference Channel	1		CCR.3.1 TDD
SSB configuration	1		SSB.1 FR2
CSI-RS configuration	1		CSI-RS.3.3 TDD
OCNG Patterns	1		OP.1
Initial BWP Configuration	1		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1		DLBWP.1.3 ULBWP.1.3
SMTC configuration	1		SMTC.1
TRS Configuration	1		TRS.2.1 TDD
PDCCH/PDSCH TCI Configuration	1		TCI.State.2
DRX configuration	1		Off
reportConfigType	1		aperiodic
reportQuantity	1		cri-RSRP
Number of reported RS	1		2
qcl-Info	1		SSB#0 for resource#0 SSB#1 for resource#1
reportSlotOffsetList	1		26
Propagation condition	1		AWGN
T1	1	s	5
EPRE ratio of PSS to SSS  EPRE ratio of PBCH DMRS to SSS  EPRE ratio of PBCH to PBCH DMRS  EPRE ratio of PDCCH DMRS to SSS  EPRE ratio of PDCCH to PDCCH  DMRS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH to PDSCH	1	dB	0
DMRS  EPRE ratio of OCNG DMRS to SSSNote 1  EPRE ratio of OCNG to OCNG DMRS Note 1			

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

Parameter	Config	Unit	CSI-RS#0	CSI-RS#1	
Angle of arrival configuration	1		Setup 1 according to A.3.15.1		
$N_{oc}^{}$ Note1	1	dBm/15kHz	-105		
$N_{oc}$ Note1	1	dBm/SSB SCS	-95.97		
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	1	dB	0	9	
CSI-RS RSRP Note2	1	dBm/SSB SCS	-95.97 -86.97		
lo <sup>Note2</sup>	1	dBm/95.04MHz	-63.97 -57.47		
$\hat{E}_s/N_{oc}$	1	dB	0 9		

Table A.7.6.3.3.2-1: CSI-RS specific test parameters

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

Note 3: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

#### A.7.6.3.3.3 Test Requirements

After 160ms from the beginning of the test, the UE shall send L1-RSRP report at slot 26 from the reception of DCI triggering the L1-RSRP measurement. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1 while meeting the accuracy requirements defined in clause 10.1.20.1. The reported L1-RSRP value shall include the Rx antenna gain in the range of  $[-10 \sim +20]$  dB.

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

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.7.6.3.4 CSI-RS based L1-RSRP measurement when DRX is used

#### A.7.6.3.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5.4.2, with the testing configurations for NR cells in Table A.7.6.3.4.1-1.

Table A.7.6.3.4.1-1: Applicable NR configurations for FR2 CSI-RS based L1-RSRP test

	Config	Description
1		NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode
Note:	The UE is only re	equired to be tested in one of the supported test configurations

#### A.7.6.3.4.2 Test parameters

There is one cells in the test, the FR2 PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.7.6.3.4.2-1 and Table A.7.6.3.4.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the CSI-RS and report aperiodically. The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-RSRP on aperiodic CSI-RS resources. UE is also configured to measure L1-RSRP based on SSB. After 480ms from the beginning of the test, the DCI trigger comes in slot 8 of a frame and UE provides the report back based on the reporting configuration as defined in Table A.7.6.3.4.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM and BFD based on the SSBs.

Table A.7.6.3.3.2-1: General test parameters

Parameter	Config	Unit	Value
SSB GSCN	1		freq1
Duplex mode	1		TDD
TDD Configuration	1		TDDConf.3.1
BW <sub>channel</sub>	1	MHz	100: N <sub>RB,c</sub> = 66
PDSCH Reference measurement channel	1		SR.3.1 TDD
RMSI CORESET Reference Channel	1		CR.3.1 TDD
Dedicated CORESET Reference Channel	1		CCR.3.1 TDD
SSB configuration	1		SSB.1 FR2
CSI-RS configuration	1		CSI-RS.3.3 TDD
OCNG Patterns	1		OP.1
Initial BWP Configuration	1		DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1		DLBWP.1.3 ULBWP.1.3
SMTC configuration	1		SMTC.1
TRS Configuration	1		TRS.2.1 TDD
PDCCH/PDSCH TCI Configuration	1		TCI.State.2
DRX configuration	1		DRX.3
reportConfigType	1		aperiodic
reportQuantity	1		cri-RSRP
Number of reported RS	1		2
qcl-Info	1		SSB#0 for resource#0 SSB#1 for resource#1
reportSlotOffsetList	1		26
Propagation condition	1		AWGN
T1	1	S	5
EPRE ratio of PSS to SSS  EPRE ratio of PBCH DMRS to SSS  EPRE ratio of PBCH to PBCH DMRS  EPRE ratio of PDCCH DMRS to SSS  EPRE ratio of PDCCH to PDCCH  DMRS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH to PDSCH  DMRS  EPRE ratio of OCNG DMRS to	1	dB	0
SSS <sup>Note 1</sup> EPRE ratio of OCNG to OCNG DMRS Note 1	1 1	1 1 1 1	1 611-11 4 1 1

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

Parameter	Config	Unit	CSI-RS#0	CSI-RS#1	
Angle of arrival configuration	1		Setup 1 accord	ling to A.3.15.1	
$N_{oc}^{}$ Note1	1	dBm/15kHz	-105		
$N_{oc}^{}$ Note1	1	dBm/SSB SCS	-95.97		
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	1	dB	0	9	
CSI-RS RSRP Note2	1	dBm/SSB SCS	-95.97	-86.97	
lo <sup>Note2</sup>	1	dBm/95.04MHz	-63.97	-57.47	
$\hat{E}_s/N_{oc}$	1	dB	0	9	

Table A.7.6.3.3.2-1: CSI-RS specific test parameters

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

Note 3: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

#### A.7.6.3.4.3 Test Requirements

After 480ms from the beginning of the test, the UE shall send L1-RSRP report at slot 26 from the reception of DCI triggering the L1-RSRP measurement. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1 while meeting the accuracy requirements defined in clause 10.1.20.1. The reported L1-RSRP value shall include the Rx antenna gain in the range of  $[-10 \sim +20]$  dB.

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

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.7.7 Measurement Performance requirements

#### A.7.7.1 SS-RSRP

### A.7.7.1.1 SA intra-frequency case measurement accuracy with FR2 serving cell and FR2 target cell

#### A.7.7.1.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clauses 10.1.2.1.1 and 10.1.2.1.1 for intra-frequency measurements.

#### A.7.7.1.1.2 Test parameters

In this set of test cases all cells are on the same carrier frequency. Supported test configurations are shown in Table A.7.7.1.1.2-1. Both absolute and relative accuracy of SS-RSRP intra-frequency measurements are tested by using the parameters in Table A.7.7.1.1.2-2 and A.7.7.1.1.2-3. In all test cases, Cell 1 is the PCell and Cell 2 the target

cell. The TCI status for Cell 1 is defined in Table A.3.16.2-1 and TRS configuration for Cell 1 is defined in Table A.3.17.2.1-1. The test consists of two time phases T1 and T2.

Table A.7.7.1.1.2-1: SS-RSRP Intra frequency SS-RSRP supported test configurations

Configuration	Description
1	120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode

Table A.7.7.1.1.2-2: SS-RSRP Intra frequency general test parameters

Doromotor	Unit	T1				T2	
Parameter		Cell 1	Cell 2			Cell 1	Cell 2
Cell ID		489	0			489	0

SSB ARFCN		fre	q1		fre	q1
Duplex mode			DD			DD
TDD configuration		TDDC	onf.3.1			onf.3.1
BW <sub>channel</sub>	MHz		$R_{B,c} = 24$			<sub>RB,c</sub> = 24
Downlink initial BWP configuration		DLB WP.0.	-		DLB WP.0. 1	-
Downlink dedicated BWP configuration		DLB WP.1.	-		DLB WP.1.	-
Uplink initial BWP configuration		ULB WP.0.	-		ULB WP.0.	-
Uplink dedicated BWP configuration		ULB WP.1. 1	-		ULB WP.1. 1	-
DRX cycle configuration		Not applic able	-		Not applic able	-
TRS configuration		TRS.2 .1 TDD	-		TRS.2 .1 TDD	-
TCI state		TCI.St ate.0	-		TCI.St ate.0	-
PDSCH Reference measurement channel		SR.3. 1 TDD	-		SR.3. 1 TDD	ı
RMSI CORESET Reference Channel		CR.3. 1 TDD	-		CR.3. 1 TDD	-
Control channel RMC		CCR. 3.1 TDD	-		CCR. 3.1 TDD	-
OCNG Patterns		OP.3	OP.3		OP.3	OP.3
SSB configuration		SSB.1 FR2	SSB.1 FR2		SSB.1 FR2	SSB.1 FR2
SMTC configuration		SMTC .1	SMTC .1		SMTC .1	SMTC .1
Time offset with Cell 1	μs	_	3		-	3
PDSCH/PDCCH subcarrier spacing	kHz	120	120		120	120
EPRE ratio of PSS to SSS  EPRE ratio of PBCH_DMRS to SSS  EPRE ratio of PBCH to PBCH_DMRS  EPRE ratio of PDCCH_DMRS to SSS  EPRE ratio of PDCCH to	dB	0	0		0	0
PDCCH_DMRS  EPRE ratio of PDSCH_DMRS to SSS  EPRE ratio of PDSCH to PDSCH_DMRS  EPRE ratio of OCNG DMRS to SSSNote 1  EPRE ratio of OCNG to OCNG DMRS Note 1	ив	U	0		0	0

Propagation conditions			AWG N	AWG N			AWG N	AWG N
Antenna configuration			1x2	1x2			1x2	1x2
Note 1:	Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted						nitted	
	power spectral density is a	achieved for a	II OFDM :	symbols.				
Note 2:	Void							
Note 3:	Void							
Note 4:	Void							
Note 5:	Void							

Table A.7.7.1.1.2-3: SS-RSRP Intra frequency OTA related test parameters

Parameter	Unit	T	1	T2		
		Cell 1	Cell 2	Cell 1	Cell 2	
Angle of arriva	nl		to clause	According to clause		
configuration	dBm/15kH	A.3.	15.1	A.3.15.1		
$N_{oc}$ Note1	Z <sup>Note4</sup>	-9	1.6	N	/A	
$N_{oc}$ Note1	dBm/SCS Note4	-82	2.6	٨	I/A	
$\hat{E}_s/N_{oc}$	dB	6.0	1.0	N/A	N/A	
Es	dBm/SCS Note4			(Table B.2.2-2 Rx Beam Peak +3.1dB)	(Table B.2.2-2 Rx Beam Peak +3.1dB)	
SSB_RPNote2	dBm/SCS	-76.6	-81.6	(Table B.2.2-2 Rx Beam Peak +3.1dB)	(Table B.2.2-2 Rx Beam Peak +3.1dB)	
$\hat{E}_{_{s}}/I_{_{ot}}$ BB Note6	dB	2.44	-5.98	-5.98	-5.98	
Io <sup>Note2</sup>	dBm/95.04 MHz <sup>Note4</sup>	-50	).05		B.2.2-2 Rx ak +30.70dB)	
	ere used, interfere cified in the test is					
and	shall be modelled	d as AWGN o	of appropriate	power for $\Lambda$	$I_{oc}$ to be	
fulfilled.  Note 2: SSB_RP, Es/lot and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: Void  Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 5: Void  Note 6: Calculation of Es/lot <sub>BB</sub> includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 36.101-2 [19], and an allowance of 2dB for UE multi-band						
	xation factor $\Sigma M$					

#### A.7.7.1.1.3 Test Requirements

The SS-RSRP measurement accuracy shall fulfil the absolute accuracy requirements in clauses 10.1.3.1.1 and relative accuracy requirements in clause 10.1.3.1.2. The following requirements are to be verified:

During T1:

Absolute accuracy of Cell 1 and absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in table A.7.7.1.1.3-1.

Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 10.1.3.1.2-1.

#### During T2:

Absolute accuracy of Cell 1 and absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in table A.7.7.1.1.3-1.

Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 10.1.3.1.2-1.

#### During T1 and T2:

Relative accuracy of Cell 1 during T2 compared with Cell 1 during T1. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 10.1.3.1.2-1.

Relative accuracy of Cell 2 during T2 compared with Cell 2 during T1. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 10.1.3.1.2-1.

Table A.7.7.1.1.3-1: SS-RSRP absolute accuracy test requirement for different UE power classes

UE power class	Test requirement Note1.2				
1	SSB_RP-TBD-δ-≤Reported RSRP(dB)≤SSB_RP+TBD+ δ dB				
2	SSB_RP-TBD-δ-≤Reported RSRP(dB)≤SSB_RP+TBD+ δ dB				
3	SSB_RP-22.6-δ-≤Reported RSRP(dB)≤SSB_RP+[20]+ δ dB				
4	SSB_RP-TBD-δ-≤Reported RSRP(dB)≤SSB_RP+TBD+ δ dB				
Note 1: SSB_RP is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone					

Note 1: SSB\_RP is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the cell under consideration

Note 2:  $\delta$  is the RSRP absolute accuracy requirement from table 10.1.3.1.1-1, e.g. if the requirement corresponding to the lo used in the test is  $\pm 6 dB$ ,  $\delta = 6$  and if the requirement corresponding to the lo used in the test is  $\pm 8 dB$ ,  $\delta = 8$ 

### A.7.7.1.2 SA inter-frequency case measurement accuracy with FR2 serving cell and FR2 target cell

#### A.7.7.1.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clauses 10.1.5.1.1 and 10.1.5.1.2 for inter-frequency measurements with the testing configurations for NR cells in Table A.7.7.1.2.1-1.

Table A.7.7.1.2.1-1: Applicable NR configurations for FR2 inter-frequency SS-RSRP accuracy test

Configuration	Description					
1	120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode					
2	240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode					

#### A.7.7.1.2.2 Test parameters

In this set of test cases there are two cells in the test, PCell (Cell 1) and a FR2 neighbour cell (Cell 2) on a different frequency than the PCell. The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters

for the Cell 1 and Cell 2 are given in Table A.7.7.1.2.2-1 and Table A.7.7.1.2.2-2 below. Both absolute and relative accuracy of RSRP inter-frequency measurements are tested by using the parameters in Table A.7.7.1.2.2-1 and Table A.7.7.1.2.2-1. The inter-frequency measurements are supported by a measurement gap.

Table A.7.7.1.2.2-1: SS-RSRP inter-frequency test parameters

Danamatan	Test 1		st 1	Test 2		
Parameter	Config	Unit	Cell 1	Cell 2	Cell 1	Cell 2
SSB ARFCN	1~2		freq1	freq2	freq1	freq2
BWchannel	1~2			00: = 24	100: N <sub>RB,c</sub> = 24	
Gap pattern ID			(	)	(	)
Duplex mode	1~2		TDD	TDD	TDD	TDD
TDD configuration	1~2		TDDC	onf.3.1	TDDC	onf.3.1
PDSCH Reference measurement channel	1~2		SR.3.1 TDD	-	SR.3.1 TDD	-
RMSI CORESET Reference Channel	1~2		CR.3.1 TDD	-	CR.3.1 TDD	-
Dedicated CORESET Reference Channel	1~2		CCR.3.1 TDD	-	CCR.3.1 TDD	-
SSB configuration	1		SSB.		SSB.	
	2		SSB.2		SSB.2	
OCNG Patterns	1~2			P.3	OF	
Initial BWP Configuration	1~2		DLBW ULBW		DLBWP.0.1 ULBWP.0.1	
Dedicated BWP configuration	1~2			/P.1.3 /P.1.3	DLBWP.1.3 ULBWP.1.3	
TRS Configuration	1~2		TRS.2	.1 TDD	TRS.2.1 TDD	
PDCCH/PDSCH TCI Configuration	1~2		TCI.S	tate.2	TCI.State.2	
SMTC configuration	1~2		SMT	ΓC.1	SMTC.1	
Time offset between Cell 2 and Cell 3	1~2	μs	3	3	3	
EPRE ratio of PSS to SSS  EPRE ratio of PBCH DMRS to SSS  EPRE ratio of PBCH to PBCH DMRS  EPRE ratio of PDCCH DMRS to SSS  EPRE ratio of PDCCH to PDCCH DMRS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH DMRS to SSS  EPRE ratio of PDSCH to PDSCH DMRS  EPRE ratio of OCNG DMRS to SSS  EPRE ratio of OCNG DMRS to SSSNote 1  EPRE ratio of OCNG to	1~2	dB	0	0	0	0
OCNG DMRS Note 1 Propagation condition	1~2	-	AWGN	AWGN	AWGN	AWGN
Antenna configuration	1~2	-	1x2	1x2	1x2	1x2

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

Note 2: Void

Table A.7.7.1.2.2-2: SS-RSRP inter frequency OTA related test parameters

		Tes	st 1	Tes	st 2				
Parameter	Unit	Cell 1	Cell 2	Cell 1	Cell 2				
Angle of arrival		_	to clause 5.4.2		to clause 5.4.2				
configuration		Spherical	Rx Beam	Spherical	Rx Beam				
		coverage	Peak	coverage	Peak				
$N_{oc}^{}$ Note1	dBm/15kH z <sup>Note4</sup>	-90.6	-90.6	(Table B.2.3-2 Rx Beam Peak +1.97dB)	(Table B.2.3-2 Rx Beam Peak - 3.03dB)				
$N_{oc}$ Note1	dBm/SCS Note4	-81.6	-81.6	(Table B.2.3-2 Rx Beam Peak +11.0dB)	(Table B.2.3-2 Rx Beam Peak +6.0dB)				
$\hat{E}_s/N_{oc}$	dB	6.0	6.0	17.0	-1.0				
SSB_RP <sup>Note2</sup>	dBm/SCS	-75.60	-75.60	(Table B.2.3-2 Rx Beam Peak +28.0dB)	(Table B.2. 3-2 Rx Beam Peak +5.0dB)				
(SSB_RP <sub>Cell 1</sub> - SSB_RP <sub>Cell 2</sub> )	dB	(	)	23.00					
$\hat{E}_{_{s}}/I_{_{ot}}$ BB Note6	dB	5.29	5.96	8.86	-3.92				
Io <sup>Note2</sup>	dBm/95.04 MHz <sup>Note4</sup>	-50.03	-50.03	(Table B.2.3-2 Rx Beam Peak +52.68dB)	(Table B.2.3-2 Rx Beam Peak +33.13dB)				
(lofreq 1 - lo freq 2)	dB		)		.55				
	used, interfered ed in the test is								
and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.  Note 2: SSB_RP, Es/lot, Io, (SSB_RP <sub>Cell 2</sub> – SSB_RP <sub>Cell 1</sub> ) and (Io <sub>freq 2</sub> – Io <sub>freq 1</sub> ) levels have been derived from other parameters for information purposes. They are not settable parameters themselves.									
Note 3: Void Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone Note 5: Void Note 6: Calculation of Es/lot <sub>BB</sub> includes the effect of UE internal noise up to the									
		value assumed for the associated Refsens requirement in clause 7.3.2 of TS 36.101-2 [19], and an allowance of 2dB for UE multi-band							

#### A.7.7.1.2.3 Test Requirements

The SS-RSRP measurement accuracy for Cell 1 and Cell 2 shall fulfil the absolute requirements in clauses 10.1.5.1.1 and relative requirements in clause 10.1.5.1.2.

Test 1:

relaxation factor  $\Sigma$  MB<sub>P</sub> or  $\Sigma$  MB<sub>S</sub> from TS 38.101-2 [19] Table 6.2.1.3-4.

Absolute accuracy of Cell 1 and absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table A.7.7.1.2.3-1.

Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in A.7.7.1.2.3-2.

#### Test 2:

Absolute accuracy of Cell 1 and absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table A.7.7.1.2.3-1.

Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in A.7.7.1.2.3-2s.

Table A.7.7.1.2.3-1: SS-RSRP absolute accuracy test requirement for different UE power classes [FFS]

# Table A.7.7.1.2.3-2: SS-RSRP relative accuracy test requirement for different UE power classes [FFS]

## A.7.7.1.3 SA inter-frequency measurement accuracy with FR1 serving cell and FR2 target cell

#### A.7.7.1.3.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clauses 10.1.5.1.1 for inter-frequency measurements with the testing configurations in Table A.7.7.1.3.1-1.

Table A.7.7.1.3.1-1: Applicable NR configurations for FR2 inter-frequency SS-RSRP accuracy test

Config	Description of serving cell	Description of target cell
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz	
	bandwidth, FDD duplex mode	
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz	120 kHz SSB SCS, 100 MHz
	bandwidth, TDD duplex mode	bandwidth, TDD duplex mode
3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz	
	bandwidth, TDD duplex mode	

#### A.7.7.1.3.2 Test parameters

In this set of test cases there are two cells in the test, PCell (Cell 1) in FR1 and Cell 2 in FR2. The test parameters for the Cell 1 and Cell 2 are given in Table A.7.7.1.3.2-1 and Table A.7.7.1.3.2-2 below. Both absolute and relative accuracy of RSRP inter-frequency measurements are tested by using the parameters in Table A.7.7.1.3.2-1 and Table A.7.7.1.3.2-2. The inter-frequency measurements are supported by a measurement gap.

Table A.7.7.1.3.2-1: SS-RSRP inter-frequency test parameters

Parameter	Config	Unit	Tes	st 1	Test 2	
Parameter	Coming		Cell 1	Cell 2	Cell 1	Cell 2
SSB ARFCN	1~3		freq1	freq2	freq1	freq2
	1		10:		10:	
	'	MHz	$N_{RB,c} = 52$		$N_{RB,c} = 52$	
BWchannel	2		10:	100:	10:	100:
D V V Chamilei			$N_{RB,c} = 52$	$N_{RB,c} = 66$	$N_{RB,c} = 52$	$N_{RB,c} = 66$
	3		40:		40:	
			$N_{RB,c} = 106$		$N_{RB,c} = 106$	
Duplex mode	1		FDD	TDD	FDD	TDD

	2		TDD		TDD	
	3		TDD		TDD	
	1		N/A		N/A	
	-		TDDConf.		TDDConf.	
TDD configuration	2		1.1	TDDConf.	1.1	TDDConf.
Ĭ	_		TDDConf.	3.1	TDDConf.	3.1
	3		2.1		2.1	
DDCCII Deference	1		SR.1.1 FDD		SR.1.1 FDD	
PDSCH Reference measurement channel	2		SR.1.1 TDD	_	SR.1.1 TDD	-
measurement channel	3		SR.2.1 FDD		SR.2.1 FDD	
RMSI CORESET	1		CR.1.1 FDD	-	CR.1.1 FDD	-
Reference Channel	2		CR.1.1 TDD	-	CR.1.1 TDD	-
Telefelioe Gliannel	3		CR.2.1 FDD	-	CR.2.1 FDD	-
Dedicated CORESET	1		CCR.1.1 FDD	-	CCR.1.1 FDD	-
Reference Channel	2		CCR.1.1 TDD	-	CCR.1.1 TDD	-
Troiding Chaine	3		CCR.2.1 TDD	-	CCR.2.1 TDD	-
	1		SSB.1		SSB.1	
			FR1	005 /	FR1	
SSB configuration	2		SSB.1	SSB.1	SSB.1	SSB.1
			FR1	FR2	FR1	FR2
	3		SSB.2 FR1		SSB.2 FR1	
OCNG Patterns	1~3			l P.1	OF	) 1
Initial BWP				VP.0.1		
Configuration	1~3			VP.0.1	DLBWP.0.1 ULBWP.0.1	
Dedicated BWP				DLBWP.1.3		/P.1.3
configuration	1~3			ULBWP.1.3		/P.1.3
TRS Configuration	1~3			.1 TDD	TRS.2.1 TDD	
PDCCH/PDSCH TCI					TOI 04-4- 0	
Configuration	1~3		ICI.S	state.2	TCI.State.2	
SMTC configuration	1~3		SM	ΓC.1	SMTC.1	
Time offset between	1~3		,	3		
Cell 2 and Cell 3	1~3	μs	`	3	3	
EPRE ratio of PSS to SSS						
EPRE ratio of PBCH						
DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH						
DMRS to SSS						
EPRE ratio of PDCCH to	4.0				•	
PDCCH DMRS	1~3	dB	0	0	0	0
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH DMRS						
EPRE ratio of OCNG						
DMRS to SSS <sup>Note 1</sup>						
EPRE ratio of OCNG to						
OCNG DMRS Note 1	4.0		N/A	A14/Ch:	NI A	A1A/O1:
Propagation condition	1~3	-	NA Link only	AWGN	NA Link only	AWGN
Antenna configuration	1~3		Link only, see clause	1x2	Link only, see clause	1x2
/ interna configuration	1 -3	_	A.3.7A	1/2	A.3.7A	172

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power

for  $\stackrel{N_{oc}}{}$  to be fulfilled.

Test 2 NOTE 3 Test 1 **Parameter** Config Unit Cell 1 Cell 2 Cell 1 Cell 2  $\overline{N}_{oc}$ dBm/15 1~4 TBD NA kHz  $\overline{N}_{oc}$ 1,2 dBm/SS TBD NA **B SCS** 3,4 TBD NA  $\hat{E}_{s}/I_{ot}$ 1~4 dΒ TBD NA As in NA NA 1,2 Link only, **TBD** Link only, Table dBm/SC see see B.2.3-2 SS-RSRPNote1 clause clause As in 3.4 A.3.7A TBD A.3.7A Table B.2.3-2 dBm/ SS-Io<sup>Note1</sup> 1~4 95.04M **TBD** RSRP+ Hz 28.98  $\overline{\hat{E}_{\scriptscriptstyle g}}/N_{oc}$ 1~4 dΒ **TBD** NA

Table A.7.7.1.3.2-2: SS-RSRP inter-frequency OTA related test parameters

### A.7.7.1.3.3 Test Requirements

The SS-RSRP measurement accuracy for Cell 2 shall fulfil the Absolute requirement in clause 10.1.5.1.1.

### A.7.7.2 SS-RSRQ

## A.7.7.2.1 SA intra-frequency measurement accuracy with FR2 serving cell and FR2 target cell

### A.7.7.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in Clause 10.1.8.1.1.

#### A.7.7.2.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configurations are shown in Table A.7.7.2.1.2-1. The absolute accuracy of SS-RSRQ intra-frequency measurement is test by using the parameters in Table A.7.7.2.1.2-2 and Table A.7.7.2.1.2-3. In all test cases, Cell 1 is the PCell and Cell 2 the target cell.

Table A.7.7.2.1.2-1: SS-RSRQ Intra frequency SS-RSRQ supported test configurations

Configuration	Description
1	120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode

Table A.7.7.2.1.2-2: SS-RSRQ Intra frequency test parameters

Darameter	Unit	Test 1		Test 2	
Parameter	Unit	Cell 1	Cell 2	Cell 1	Cell 2

Note 1: RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 3: No additional noise is added by the test system in Test 2.

SSB ARFCN			Fred	71	Fr	eq1
Duplex mode			TDD		TDD	
TDD configuration			TDDCo	nf.3.1	TDDC	Conf.3.1
BW <sub>channel</sub>		MHz	100: N <sub>RE</sub>	<sub>3,c</sub> = 66	100: N	<sub>RB,c</sub> = 66
	Initial DL BWP		DLBWF			
BWP	BWP Dedicated DL BWP			DLBV	VP.1.1	
configuration	Initial UL BWP			ULBV	VP.0.1	
	Dedicated UL BWP			ULBV	/P.1.1	
TRS configuration			TRS.2.1		TRS.2.	
1 K3 Corniguration			TDD		1 TDD	
TCI state			TCI.State		TCI.Sta	
101 State			.0		te.0	
PDSCH Reference	measurement channel		SR.3.1		SR.3.1	
1 Been released	modear of fier to that in or		TDD		TDD	
RMSI CORESET R	eference Channel		CR.3.1	_	CR.3.1	
			TDD		TDD	
Control channel RM	1C		CCR.3.1	-	CCR.3.	-
			TDD	00.4	1 TDD	OD 4
OCNG Patterns			OP.1	OP.1	OP.1	OP.1
SMTC configuration	1		SMTC.1		SSB.1	
SSB configuration			SSB.1 FR2	SSB.1 FR2	SSB.1 FR2	FR2
PDSCH/PDCCH su	hcarrier spacing	kHz	120	120	120	120
SS-RSSI-Measurer		KI IZ	120		plicable	120
EPRE ratio of PSS				110171	o ii o da bi o	
EPRE ratio of PBC						
EPRE ratio of PBC						
EPRE ratio of PDC						
	CH to PDCCH DMRS	dB	0	0	0	0
EPRE ratio of PDS	_		-	-		
	CH to PDSCH DMRS					
	G DMRS to SSSNote 1					
	G to OCNG DMRS Note 1					
$\hat{E}_s/N_{oc}$		dB	3	3	-3	-3
Propagation conditi	on		AWO	SN .	AV	VGN
Antenna configurati			1x2			x2
11 / / 0010						

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

Table A.7.7.2.1.2-3: SS-RSRQ Intra frequency OTA related test parameters

	Unit	Tes			st 2	
	Ollit	Cell 1	Cell 2	Cell 1	Cell 2	
Angle of arrival configuration		Accord clause A		According A.3.	to clause 15.1	
$N_{oc}^{}$ Note1	dBm/15kHz <sup>N</sup> ote4	-9	5	-6	95	
$N_{oc}^{}$ Note1	dBm/SCS <sup>Note</sup>	-86		-86		
SS-RSRP <sup>Note2</sup>	dBm/SCS Note4	-83	-83	-89	-89	
SS-RSRQ Note2	dB	-14.77	-14.77	-16.81	-16.81	
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	-1.76	-1.76	-4.76	-4.76	
lo <sup>Note2</sup>	dBm/95.04 MHz <sup>Note4</sup>	-5	0	-54	-54	
Note 1: Interference from other cells and	noise sources no	ot specified	in the test	is assumed to	be constant	
over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.  Note 2: SS-RSRQ, SS-RSRP, and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: SS-RSRQ and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone NR operating band groups are as defined in Clause 3.5.2.  Note 7: Void Note 8: Void						

### A.7.7.2.1.3 Test Requirements

The SS-RSRQ absolute measurement accuracy in test 1shall be within the range Nominal SS-RSRQ+2.5dB to Nominal SS-RSRQ-3.5dB and the SS-RSRQ measurement accuracy in test 2 shall be within the range Nominal RSRQ+3.5dB to Nominal RSRQ-4.5dB according to the requirements in clause 10.1.8.1.1 with an additional -1dB margin reflecting the possible impact of UE self noise in the test.Nominal RSRQ is the value shown in table A.7.7.2.1.2-3. Relative accuracy shall fulfil the requirements in clause 10.1.8.1.1.

## A.7.7.2.2 SA Inter-frequency measurement accuracy with FR2 serving cell and FR2 TDD target cell

### A.7.7.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.9.1.1 and 10.1.9.1.2 for inter-frequency measurement.

#### A.7.7.2.2.2 Test Parameters

In this test case the two cells (i.e., Cell 1 and Cell 2) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table A.7.7.2.2.2-1. Both absolute accuracy and relative accuracy requirements of SS-RSRQ inter-frequency measurement are tested by using test parameters in Table A.7.7.2.2.2-2 and Table A.7.7.2.2.2-3. In all test cases, Cell 1 is the PCell and Cell 2 is target cell.

Table A.7.7.2.2.2-1: SS-RSRQ Inter frequency SS-RSRQ supported test configurations

Configuration	Description
1	120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode

Table A.7.7.2.2.2-2: SS-RSRQ Inter frequency general test parameters

Doromotor	Unit	Test 1		Test 2	
Parameter	Unit	Cell 1	Cell 2	Cell 1	Cell 2

SSB ARFCN		Freq1	freq2	freq1	Freq2
Duplex mode		T	DD	TE	DD
TDD configuration		TDDC	onf.3.1	TDDConf.3.1	
BW <sub>channel</sub>	MHz	100: N <sub>F</sub>	$R_{B,c} = 66$	100: N <sub>F</sub>	$_{RB,c} = 66$
PDSCH Reference measurement channel		SR.3.1 TDD	-	SR.3.1 TDD	-
RMSI CORESET Reference Channel		CR.3.1 TDD	-	CR.3.1 TDD	-
OCNG Patterns		OP.1	OP.1	OP.1	OP.1
SMTC configuration		SMTC. 1 FR2	SMTC. 1 FR2	SMTC. 1 FR2	SMTC. 1 FR2
PDSCH/PDCCH subcarrier spacing	kHz	120	120	120	120
EPRE ratio of PSS to SSS					
EPRE ratio of PBCH_DMRS to SSS					
EPRE ratio of PBCH to PBCH_DMRS					
EPRE ratio of PDCCH_DMRS to SSS					
EPRE ratio of PDCCH to PDCCH_DMRS	dB	0	0	0	0
EPRE ratio of PDSCH_DMRS to SSS					
EPRE ratio of PDSCH to PDSCH_DMRS					
EPRE ratio of OCNG DMRS to SSSNote 1					
$\hat{E}_s/N_{oc}$	dB	-1.75	-1.75	3	-1.75

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

Table A.7.7.2.2.2-3: SS-RSRQ Inter frequency OTA related test parameters

Parameter	Unit	Tes	st 1	Test 2	
Farailleter	Offic	Cell 1	Cell 2	Cell 1	Cell 2

Note 7:

Void

AoA setup		Setup 1 in clause Setup 1 in A.3.15.			in clause .15.
$N_{oc}^{}$ Note1	dBm/15kHz <sup>N</sup> ote4	-94.03		-94.03	
$N_{oc}^{}$ Note1	dBm/SCS <sup>Note</sup>	-85.0		-85.0	
SSB_RPNote2	dBm/SCS Note4	-86.75	-86.75	-88	-88
SS-RSRQ <sup>Note2</sup>	dB	-14.75	-14.75	-15.56	-15.56
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	-1.75	-1.75	-3	-3
lo <sup>Note2</sup>	dBm/95.04 MHz <sup>Note4</sup>	-53.8	-53.8	-54.25	-54.25
Note 1: Interference from other cells and constant over subcarriers and tim for $N_{oc}$ to be fulfilled.	e and shall be m	nodelled as	s AWGN of	f appropria	ed to be te power
Note 2: SS-RSRQ, SSB_RP, and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: SS-RSRQ and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone Note 6: Void					

### A.7.7.2.2.3 Test Requirements

The SS-RSRQ absolute measurement accuracy in test 1 shall be within the range Nominal SS-RSRQ+2.5dB to Nominal SS-RSRQ -3.5dB and the SS-RSRQ measurement accuracy in test 2 shall be within the range Nominal SS-RSRQ +3.5dB to Nominal SS-RSRQ -4.5dB according to the requirements in clause 10.1.10.1.1 with an additional -1dB margin reflecting the possible impact of UE self noise in the test.

The SS-RSRQ relative measurement accuracy shall fulfil the requirements in clause 10.1.10.1.2.

### A.7.7.3 SS-SINR

# A.7.7.3.1 SA intra-frequency case measurement accuracy with FR2 serving cell and FR2 target cell

### A.7.7.3.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in Clause 10.1.13.1.1.

#### A.7.7.3.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configurations are shown in Table A.7.7.3.1.2-1. The absolute accuracy of SS-SINR intra-frequency measurement is test by using the parameters in Table A.7.7.3.1.2-2 and Table A.7.7.3.1.2-3. In all test cases, Cell 1 is the PCell and Cell 2 the target cell. The TCI status for Cell 1 is defined in Table A.3.16.2-1 and TRS configuration for Cell 1 is defined in Table A.3.17.2.1-1.

Table A.7.7.3.1.2-1: SS-SINR Intra frequency SS-SINR supported test configurations

Configuration	Description
1	120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode

Table A.7.7.3.1.2-2: SS-SINR Intra frequency test parameters

Parameter	Unit	Test 1		Test 2	
Parameter	Unit	Cell 1	Cell 2	Cell 1	Cell 2
SSB ARFCN		Freq2		Fre	eq2

Duplex mode		TE	DD	TE	DD
TDD configuration		TDDC	onf.3.1	TDDC	onf.3.1
BW <sub>channel</sub>	MHz	100: N <sub>F</sub>	RB,c = 66	100: N <sub>F</sub>	RB,c = 66
Downlink initial BWP configuration			DLBV	VP.0.1	
Downlink dedicated BWP configuration			DLBV	VP.1.1	
Uplink initial BWP configuration			ULBV	VP.0.1	
Uplink dedicated BWP configuration			ULBV	VP.1.1	
DRX cycle configuration	ms			plicable	
TRS configuration			TRS.2	.1 TDD	
TCI state				State.0	
AoA setup			etup 3 defi	ned in A.3.	15
PDSCH Reference measurement channel		SR.3.1		SR.3.1	
1 BOOT Reference measurement charmer		TDD		TDD	
RMSI CORESET Reference Channel		CR.3.1	_	CR.3.1	
		TDD		TDD	
Dedicated RMSI CORESET Reference		CCR.3	-	CCR.3.	_
Channel		.1 TDD		1 TDD	
OCNG Patterns					OP.1
SMTC configuration		000 4		TC.1	000.4
SSB configuration		SSB.1 FR2	SSB.1 FR2	SSB.1 FR2	SSB.1 FR2
PDSCH/PDCCH subcarrier spacing	kHz	120	120	120	120
SS-RSSI-Measurement			Not Ap	plicable	
EPRE ratio of PSS to SSS					
EPRE ratio of PBCH DMRS to SSS					
EPRE ratio of PBCH to PBCH_DMRS					
EPRE ratio of PDCCH_DMRS to SSS					
EPRE ratio of PDCCH to PDCCH_DMRS	dB	0	0	0	0
EPRE ratio of PDSCH_DMRS to SSS					
EPRE ratio of PDSCH to PDSCH_DMRS					
EPRE ratio of OCNG DMRS to SSSNote 1					
EPRE ratio of OCNG to OCNG DMRS Note 1					
$\hat{E}_s/N_{oc}$	dB	4.54	2.66	-3	-3
Propagation conditions		AWGN			
Antenna configuration		1x2			

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

Note 3: SS-SINR, SS-RSRP, and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-SINR and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Table A.7.7.3.1.2-3: SS-SINR Intra frequency OTA related test parameters

Parameter	Unit	Tes	st 1	Test 3	
Parameter	Onit	Cell 1	Cell 2	Cell 1	Cell 2
Angle of arrival configuration		According to clause A.3.15.1		Accord	U

$N_{oc}^{}$ Note1		dBm/15kHz Note4	-105		-105		
$N_{oc}^{ m Note1}$		dBm/SCS Note3	-96		-96		
SS-RSRF	<b>⊃</b> Note2	dBm/SCS Note4	-91.46 -93.34		-99	-99	
SS-SINR	SS-SINR Note2		0 -3.2		-4.76	-4.76	
$\hat{E}_{s}/I_{ot}$		dB	0	-3.2	-4.76	-4.76	
Io <sup>Note2</sup>		dBm/95.04 MHz Note4 -59.2 -64				64	
Note 1:	Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.						
Note 2: Note 3: Note 4: Note 5: Note 6: Note 7: Note 8:	<ul> <li>Note 2: SS-SINR, SS-RSRP, and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.</li> <li>Note 3: SS-SINR and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.</li> <li>Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone</li> <li>Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone</li> <li>Note 6: NR operating band groups are as defined in clause 3.5.2.</li> <li>Void</li> </ul>						

### A.7.7.3.1.3 Test Requirements

The SS-SINR absolute measurement accuracy in test 1 shall be within the range Nominal SS-SINR+3B to Nominal SS-SINR -4dB and the SS-SINR measurement accuracy in test 2 shall be within the range Nominal SS-SINR +3.5dB to Nominal SS-SINR -4.5dB according to the requirements in clause 10.1.10.13.1 with an additional -1dB margin reflecting the possible impact of UE self noise in the test. The relative SS-SINR measurement accuracy shall fulfil the requirements in clause 10.1.13.1.1.

# A.7.7.3.2 SA Inter-frequency measurement accuracy with FR2 serving cell and FR2 TDD target cell

### A.7.7.3.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in Clause 10.1.15.1.1 and 10.1.15.1.2 for inter-frequency measurement.

#### A.7.7.3.2.2 Test Parameters

In this test case the two cells (i.e., Cell 1 and Cell 2) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table A.7.7.3.2.2-1. Both absolute accuracy and relative accuracy requirements of SS-SINR inter-frequency measurement are tested by using test parameters in Table A.7.7.3.2.2-2 and Table A.7.7.3.2.2-3. In all test cases, Cell 1 is the PCell and Cell 2 is target cell. The TCI status for Cell 1 is defined in Table A.3.16.2-1 and TRS configuration for Cell 1 is defined in Table A.3.17.2.1-1.

Table A.7.7.3.2.2-1: SS-SINR Inter frequency SS-SINR supported test configurations

Configuration	Description
1	120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode

Table A.7.7.3.2.2-2: SS-SINR Inter frequency general test parameters

Dougranton	l l m i 4	Te	st 1	Tes	st 2	Test 3		
Parameter	Unit	Cell 1	Cell 2	Cell 1	Cell 2	Cell 1	Cell 2	
SSB ARFCN		freq1	freq1 freq2		freq2	freq1	freq2	
Duplex mode		TI	DD	T	DD	TE	TDD	
TDD configuration		TDDC	onf.3.1		onf.3.1	TDDC	onf.3.1	
BW <sub>channel</sub>	MHz	100: N <sub>F</sub>	$_{RB,c} = 66$	100: N <sub>F</sub>	$_{RB,c} = 66$	100: N <sub>F</sub>	$R_{B,c} = 66$	
Downlink initial BWP configuration				DLBV	VP.0.1			
Downlink dedicated BWP configuration				DLBV	VP.1.1			
Uplink initial BWP configuration				ULBV	VP.0.1			
Uplink dedicated BWP configuration				ULBV	VP.1.1			
DRX cycle configuration	ms				plicable			
TRS configuration					.1 TDD			
TCI state					tate.0			
AoA setup			Se	etup 3 defii	ned in A.3.	15		
PDSCH Reference measurement channel		SR.3.1		SR.3.1		SR.3.1	_	
1 DOCT I Reference measurement channel		TDD	_	TDD	-	TDD	_	
		CR.3.1		CR.3.1		CR.3.1		
RMSI CORESET Reference Channel		TDD	-	TDD	-	TDD	-	
CONO Detterme		00.4	00.4	00.4	00.4	00.4	OD 4	
OCNG Patterns		OP.1	OP.1	OP.1	OP.1	OP.1	OP.1	
SMTC configuration		SMTC.	SMTC.	SMTC.	SMTC.	SMTC.	SMTC.	
DDCCH/DDCCH subservior engaing	kHz	1 FR2	1 FR2 120	1 FR2	1 FR2 120	1 FR2 120	1 FR2	
PDSCH/PDCCH subcarrier spacing EPRE ratio of PSS to SSS	KHZ	120	120	120	120	120	120	
EPRE ratio of PSCH DMRS to SSS								
EPRE ratio of PBCH to PBCH DMRS								
EPRE ratio of PDCCH DMRS to SSS								
EPRE ratio of PDCCH to PDCCH DMRS	dB	0	0	0	0	0	0	
EPRE ratio of PDSCH DMRS to SSS								
EPRE ratio of PDSCH to PDSCH DMRS								
EPRE ratio of OCNG DMRS to SSSNote 1								
$\hat{E}_s/N_{oc}$	dB	-0.5	-0.5	11.0	11.0	-3.0	-3.0	
Propagation conditions		AWGN						
Antenna configuration		1x2						
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral						ectral		

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

Table A.7.7.3.2.2-3: SS-SINR Inter frequency OTA related test parameters

Doromotor	Unit	Test 1		Test 2		Test 3	
Parameter		Cell 1	Cell 2	Cell 1	Cell 2	Cell 1	Cell 2

Angle of arrival configuration	degrees	accor	up 1 ding to 15.1	accord	Setup 1 according to A.3.15.1		Setup 1 according to A.3.15.1	
$N_{oc}^{$	dBm/15kHz Note4	-105		-105		-105		
$N_{oc}^{$	dBm/SCS Note3 -96 -96		96	-96				
SS-RSRP <sup>Note2</sup>	dBm/SCS Note4	96.5 -96.5		-85	-85	-99	-99	
SS-SINR <sup>Note2</sup>	dB	-0.5	-0.5	11	11	-3.0	-3.0	
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	-0.5	-0.5	11	11	-3.0	-3.0	
Io <sup>Note2</sup>	dBm/95.04 MHz <sup>Note4</sup>	-69.3		-55.4		-65.24		
Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.  Note 2: SS-SINR, SS-RSRP, and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: SS-SINR and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone								

### A.7.7.3.2.3 Test Requirements

Note 5: Note 6:

Note 7:

Note 8:

Note 9:

Void

Void

Void

The SS-SINR absolute measurement accuracy in test 1 shall be within the range Nominal SS-SINR +3dB to Nominal SS-SINR -4dB and the SS-SINR measurement accuracy in test 2 shall be within the range Nominal SS-

As observed with 0dBi gain antenna at the centre of the quiet zone

NR operating band groups are as defined in Clause 3.5.2.

SINR +3.5dB to Nominal SS-SINR -4.5dB according to the requirements in clause 10.1.15.1.1 with an additional -1dB margin reflecting the possible impact of UE self noise in the test.

The SS-SINR relative measurement accuracy shall fulfil the requirements in clause 10.1.15.1.2.

### A.7.7.4 L1-RSRP measurement for beam reporting

### A.7.7.4.1 SSB based L1-RSRP measurement

### A.7.7.4.1.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clauses 9.5.2 and clause 10.1.20.1 for L1-RSRP measurements based on SSB with the testing configurations for NR cells in Table A.7.7.4.1.1-1.

The AoA setup for this test is Setup 1 as defined in clause A.3.15.

Table A.7.7.4.1.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test

	Config	Description
	1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
	2	LTE FDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note:	The UE is only re	equired to be tested in one of the supported test configurations in each supported band

### A.7.7.4.1.2 Test parameters

In this set of test cases there are two cells in the test, PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.7.7.4.1.2-1 and Table A.7.7.4.1.2-2 below. The absolute and relative accuracy of L1-RSRP measurements are tested by using the parameters in Table A.7.7.4.1.2-1 and Table A.7.7.4.1.2-2.

Here is no measurement gap configured in the test. Before the test, UE is configured one SSB resource set with two SSB resources. UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSB resources 0 and 1.

Table A.7.7.4.1.2-1: FR2 SSB based L1-RSRP general test parameters

Parameter	Config	Unit	Test 1	Test 2
SSB GSCN	1~2		freq1	freq1
Duplex mode	1~2		TDD	TDD
TDD Configuration	1~2		TDDConf.3.1	TDDConf.3.1
BW <sub>channel</sub>	1~2	MHz	100: N <sub>RB,c</sub> = 66	100: N <sub>RB,c</sub> = 66
PDSCH Reference measurement channel	1~2		SR.3.1 TDD	SR.3.1 TDD
RMSI CORESET Reference Channel	1~2		CR.3.1 TDD	CR.3.1 TDD
Dedicated CORESET Reference Channel	1~2		CCR.3.1 TDD	CCR.3.1 TDD
SSB configuration	1		SSB.1 FR2	SSB.1 FR2
33B configuration	2		SSB.2 FR2	SSB.2 FR2
OCNG Patterns	1~2		OP.1	OP.1
Initial BWP Configuration	1~2		DLBWP.0.1 ULBWP.0.1	DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1~2		DLBWP.1.3 ULBWP.1.3	DLBWP.1.3 ULBWP.1.3
TRS Configuration	1~2		TRS.2.1 TDD	TRS.2.1 TDD
PDCCH/PDSCH TCI Configuration	1~2		TCI.State.2	TCI.State.2
SMTC configuration	1~2		SMTC.1	SMTC.1
reportConfigType	1~2		periodic	periodic
reportQuantity	1~2		ssb-Index-RSRP	ssb-Index-RSRP
Number of reported RS	1~2		2	2
L1-RSRP reporting period	1~2		slot640	slot640
Propagation condition	1~2		AWGN	AWGN
Antenna configuration	1~2		1x2	1x2
EPRE ratio of PSS to SSS				
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS	1~2	dB	0	0
EPRE ratio of PDSCH to PDSCH DMRS				
EPRE ratio of OCNG DMRS to SSSNote 1				
EPRE ratio of OCNG to OCNG DMRS Note 1				

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power

for  $N_{oc}$  to be fulfilled.

Test 2 NOTE 3 Test 1 **Parameter** Config Unit SSB0 SSB1 SSB0 SSB1 Angle of arrival configuration Setup 1 according to Setup 1 according to A.3.15.1 A.3.15.1  $N_{oc}$ dBm/15 1~4 -100 n.a. kHz  $\overline{N_{oc}}$ 1,2 dBm/SS -91 n.a. 3.4 **B SCS** -88 n.a.  $\hat{E}_{s}/I_{ot}$ 1~4 10 -2 dB n.a. As in Table B.2.4-2 1,2 dBm/SC -81 -93 SS-RSRPNote1 3,4 S -78 -90 As in Table B.2.4-2 dBm/ -51.57 IoNote1 1~4 95.04M SS-RSRP+28.98 Hz  $\hat{E}_{s}/N_{oc}$ 1~4 dB 10 -2 n.a.

Table A.7.7.4.1.2-2: FR2 SSB based L1-RSRP OTA related test parameters

Note 1: RSRP and lo levels have been derived from other parameters for information purposes.

They are not settable parameters themselves.

Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 3: No additional noise is added by the test system in Test 2.

### A.7.7.4.1.3 Test Requirements

After 640ms from the beginning of the test, , the L1-RSRP measurement accuracy for SSB#0 and SSB#1 of Cell 2 shall fulfil the requirements in clauses 10.1.20.1.

The reported L1-RSRP value shall include the Rx antenna gain in the range of  $[-10 \sim +20]$ dB.

### A.7.7.4.2 CSI-RS based L1-RSRP measurement on resource set with repetition off

#### A.7.7.4.2.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clauses 9.5.3 and clause 10.1.20.2 for L1-RSRP measurements based on CSI-RS with the testing configurations for NR cells in Table A.7.7.4.2.1-1.

The AoA setup for this test is Setup 1 as defined in clause A.3.15.

Table A.7.7.4.2.1-1: Applicable NR configurations for FR1 CSI-RS based L1-RSRP test

Config	Description			
1	NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode			

### A.7.7.4.2.2 Test parameters

In this set of test cases there are one cell in the test, PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.7.7.4.2.2-1 and Table A.7.7.4.2.2-2 below. The absolute and relative accuracy of L1-RSRP measurements are tested by using the parameters in Table A.7.7.4.2.2-1 and Table A.7.7.4.2.2-2.

There is no measurement gap configured in the test. Before the test, UE is configured one CSI-RS resource set with two CSI-RS resources. UE is configured to perform RLM and BFD based on SSB 0 and 1. CSI-RS is not transmitted in the same OFDM symbols as SSB.

Table A.7.7.4.2.2-1: FR2 CSI-RS based L1-RSRP general test parameters

Parameter	Config	Unit	Test 1	Test 2
SSB GSCN	1		freq1	freq1
Duplex mode	1		TDD	TDD
TDD Configuration	1		TDDConf.3.1	TDDConf.3.1
BW <sub>channel</sub>	1	MHz	100: N <sub>RB,c</sub> = 66	100: N <sub>RB,c</sub> = 66
PDSCH Reference measurement channel	1		SR.3.1 TDD	SR.3.1 TDD
RMSI CORESET Reference Channel	1		CR.3.1 TDD	CR.3.1 TDD
Dedicated CORESET Reference Channel	1		CCR.3.1 TDD	CCR.3.1 TDD
SSB configuration	1		SSB.1 FR2	SSB.1 FR2
OCNG Patterns	1		OP.1	OP.1
Initial BWP Configuration	1		DLBWP.0.1 ULBWP.0.1	DLBWP.0.1 ULBWP.0.1
Dedicated BWP configuration	1		DLBWP.1.3 ULBWP.1.3	DLBWP.1.3 ULBWP.1.3
TRS Configuration	1		TRS.2.1 TDD	TRS.2.1 TDD
PDCCH/PDSCH TCI Configuration	1		TCI.State.2	TCI.State.2
SMTC configuration	1		SMTC.1	SMTC.1
CSI-RS	1		CSI-RS.3.2 TDD	CSI-RS.3.2 TDD
reportConfigType	1		periodic	periodic
reportQuantity	1		cri-RSRP	cri-RSRP
Number of reported RS	1		2	2
L1-RSRP reporting period	1		slot80	slot80
Propagation condition	1		AWGN	AWGN
Antenna configuration	1		1x2	1x2
EPRE ratio of PSS to SSS				
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS	1	dB	0	0
EPRE ratio of PDSCH to PDSCH DMRS	'	uБ	O O	Ů
EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>				
EPRE ratio of OCNG to OCNG DMRS Note 1				

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power

for  $N_{oc}$  to be fulfilled.

			Tes	st 1	Test 2 NOTE 3	
Parameter	Config	Unit	CSI-RS0	CSI-RS1	CSI-RS0	CSI- RS1
Angle of arrival configuration			Setup 1 ac A.3.		Setup 1 according t A.3.15.1	
$N_{oc}$	1~2	dBm/15 kHz	-100		n.a.	
$N_{oc}$	1~2	dBm/SS B SCS	-91		n.a. n.a.	
$\hat{\mathbf{E}}_{\mathrm{s}}/\mathbf{I}_{\mathrm{ot}}$	1~2	dB	10	-2	n.a.	
CSI-RS-RSRPNote1	1~2	dBm/SC S	-81	-93	As in Table	e B.2.4-2
lo <sup>Note1</sup>	1~2	dBm/ 95.04M Hz	-59.86		SS-RSRP+28.98	
$\hat{E_s}/N_{oc}$	1~2	dB	-51.57	-2	n.a.	

Table A.7.7.4.2.2-2: FR2 CSI-RS based L1-RSRP OTA related test parameters

Note 1: RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 3: No additional noise is added by the test system in Test 2.

### A.7.7.4.2.3 Test Requirements

After 640ms from the beginning of the test, the L1-RSRP measurement accuracy for CSI-RS#0 and CSI-RS#1 of Cell 1 shall fulfil the requirements in clause 10.1.20.2. The reported L1-RSRP value shall include the Rx antenna gain in the range of  $[-10 \sim +20]$ dB.

### A.8 E-UTRA standalone tests for NR RRM

Editor notes: All NR RRM tests under E-UTRA standalone operations are included in this Annex. All EN-DC related NR RRM tests are in A.6

### A.8.1 Void

### A.8.2 RRC IDLE state mobility

### A.8.2.1 Inter-RAT NR Cell re-selection

### A.8.2.1.1 E-UTRA Cell reselection to higher priority NR target Cell in FR1

### A.8.2.1.1.1 Test Purpose and Environment

This test is to verify the requirement for the E-UTRAN to NR inter-RAT cell reselection requirements specified in clause 4.2.2.5.6 in TS 36.133 [15].

The test scenario comprises of 1 E-UTRA cell and 1 NR cell as given in tables A.8.2.1.1.1-1, A.8.2.1.1.1-2, A.8.2.1.1.1-3 and A.8.2.1.1.1-4. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. E-UTRA cell 1 is already identified by the UE prior to the start of the test. Cell 2 is of higher priority than cell 1.

Table A.8.2.1.1.1-1: Supported test configurations

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

Table A.8.2.1.1.1-2: General test parameters for E-UTRA cell re-selection FR1 NR cell test case

Parameter		Unit	Test	Value	Comment
			configuration		
Initial condition	Active cell		1, 2, 3, 4, 5, 6	Cell1	The UE camps on cell 1 in the initial phase and during T3 period the UE reselects to cell 2
T3 end	Active cell		1, 2, 3, 4, 5, 6	Cell2	The UE shall perform reselection to cell 2
condition	Neighbour cells		1, 2, 3, 4, 5, 6	Cell1	during T3
	Neighbour cells		1, 2, 3, 4, 5, 6	Cell2	1
RF Channe	el Number		1, 2, 3, 4, 5, 6	1, 2	E-UTRAN radio channel (1) and NR radio channel (2) are used for this test
Time offset	t between cells		1, 4	3 ms	Asynchronous cells
			2, 5	3 μs	Synchronous cells
			3, 6	3 μs	Synchronous cells
Access Ba	rring Information	-	1, 2, 3, 4, 5, 6	Not Sent	No additional delays in random access procedure.
DRX cycle	length	s	1, 2, 3, 4, 5, 6	1.28	The value shall be used for all cells in the test.
NR PRACE	H configuration index		1, 2, 3, 4, 5, 6	102	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
T1		S	1, 2, 3, 4, 5, 6	15	T1 needs to be defined so that cell reselection reaction time is taken into account.
T2		S	1, 2, 3, 4, 5, 6	>7	During T2, cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that cell 2 has not been detected by the UE prior to the start of period T3.
T3		S	1, 2, 3, 4, 5, 6	75	T3 needs to be defined so that cell reselection reaction time is taken into account.

Table A.8.2.1.1.1-3: Cell specific test parameters for NR cell 2

Parameter	Unit	Test	Cell 2			
		configuration	T1	T2	T3	
TDD configuration		1, 4		N/A		
		2, 5		TDDConf.1.1		
		3, 6	TDDConf.2.1			
PDSCH Reference		1, 4	SR.1.1 FDD			
measurement channel		2, 5	SR.1.1 TDD			
		3, 6		SR.2.1 TDD		
RMSI CORESET		1, 4	CR.1.1 FDD			
Reference Channel		2, 5	CR.1.1 TDD			
		3, 6		CR.2.1 TDD		

RMC CORESET		1, 4		CCR.1.1 FDD		
Reference Channel		2, 5		CCR.1.1 TDD		
		3, 6		CCR.2.1 TDD		
OCNG Patterns		1, 2, 3, 4, 5, 6		OP.1		
SMTC configuration		1, 2, 3, 4, 5, 6		SMTC.1		
SSB configuration		1. 4		SSB.1 FR1		
COB Comigaration		2, 5		SSB.1 FR1		
		3, 6		SSB.2 FR1		
Initial DL BWP		1, 2, 3, 4, 5, 6		DLBWP.0.1		
configuration		1, 2, 0, 4, 0, 0		DEDVVI .O.1		
Initial UL BWP		1, 2, 3, 4, 5, 6		ULBWP.0.1		
configuration		1, 2, 0, 1, 0, 0		OLDVVI .O. I		
RLM-RS		1, 2, 3, 4, 5, 6		SSB		
Qrxlevmin	dBm/SCS	1, 2, 4, 5		-140		
Q:XIOVIIIII	uBiii/000	3, 6		-137		
Pcompensation	dB	1, 2, 3, 4, 5, 6		0		
Qhysts	dB	1, 2, 3, 4, 5, 6		0		
Qoffset <sub>s, n</sub>	dB	1, 2, 3, 4, 5, 6		0		
Cell selection and	45	1, 2, 3, 4, 5, 6				
reselection_quality_m		1, 2, 0, 1, 0, 0		SS-RSRP		
easurement						
Ê <sub>s</sub> /I <sub>ot</sub>	dB	1, 4	-4	-infinity	12	
L <sub>s</sub> /I <sub>ot</sub>		2, 5				
		3, 6				
<b>N</b> I	dBm/SCS	1, 4	-98			
$N_{oc}$ Note2		2, 5		-98		
		3, 6		-95		
<b>N</b> I	dBm/15 kHz	1, 4		-98		
$N_{oc}$ Note2		2, 5				
		3, 6				
$\hat{E}_s/N_{oc}$	dB	1, 4	-4	-infinity	12	
25/1100		2, 5		,		
		3, 6				
SS-RSRP Note3	dBm/SCS	1, 4	-102	-infinity	-86	
		2, 5	-102	-infinity	-86	
		3, 6	-99	-infinity	-83	
lo	dBm/9.36 MHz	1, 4	-68.60	-infinity	-57.78	
	dBm/9.36 MHz	2, 5	-68.60	-infinity	-57.78	
	dBm/38.16 MHz	3, 6	-62.50	-infinity	-51.69	
Treselection	S	1, 2, 3, 4, 5, 6	0	0	0	
Snonintrasearch	dB	1, 2, 3, 4, 5, 6		Not sent		
Thresh <sub>x, high</sub>	dB	1, 2, 3, 4, 5, 6		48		
Thresh <sub>serving, low</sub>	dB	1, 2, 3, 4, 5, 6		44		
Thresh <sub>x, low</sub>	dB	1, 2, 3, 4, 5, 6		50		
Propagation Condition		1, 2, 3, 4, 5, 6		AWGN		
Note 1: OCNC shall b					:441	

Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant  $\mathcal{N}$ 

over subcarriers and time and shall be modelled as AWGN of appropriate power for  $\frac{N_{oc}}{}$  to be fulfilled.

Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table A.8.2.1.1.1-4: Cell specific test parameters for E-UTRA cell 1

Parameter	Unit	Cell 1		
		T1	T2	Т3
E-UTRA RF Channel number			1	
BW <sub>channel</sub>	MHz		10	
OCNG Patterns defined in TS 36.133 [15]			for test configur	
clause A.3.2		OP.2 FDD	for test configur	ation 4, 5, 6
PBCH_RA	dB			
PBCH_RB	dB			
PSS_RA	dB			
SSS_RA	dB			
PCFICH_RB	dB			
PHICH_RA	dB		•	
PHICH_RB	dB		0	
PDCCH_RA	dB			
PDCCH_RB	dB			
PDSCH_RA	dB			
PDSCH_RB	dB			
OCNG_RA <sup>Note 1</sup>	dB			
OCNG_RBNote 1	dB			
Qrxlevmin	dBm		-140	
$N_{oc}^{}$ Note 2	dBm/15 kHz		-98	
RSRP Note 3	dBm/15 KHz	-84	-84	-84
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	14	14	14
$\hat{E}_s/N_{oc}$	dB	14	14	14
Treselectioneutran	S		0	u.
Snonintrasearch	dB		50	
Thresh <sub>x, high</sub>	dB		48	
Thresh <sub>serving, low</sub>	dB		44	
Thresh <sub>x, low</sub>	dB		50	
Propagation Condition			AWGN	
Note 1: OCNG shall be used such that both spectral density is achieved for all C		ated and a cons	stant total transr	nitted power

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

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

#### A.8.2.1.1.2 Test Requirements

The cell reselection delay to a higher priority NR cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the RRCSetupRequest message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to a higher priority cell shall be less than 68 s.

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

The cell re-selection delay to a higher priority cell can be expressed as: Thigher priority search + Tevaluate, NR + NOTE:  $T_{SI-NR}$ , and to a lower priority cell can be expressed as:  $T_{evaluate, NR} + T_{SI-NR}$ ,

#### Where:

Thigher priority search See clause 4.2.2 in TS 36.133 [15]

T<sub>evaluate, NR</sub> See Table 4.2.2.5.6-1 in clause 4.2.2.5.6 in TS 36.133 [15]

T<sub>SI-NR</sub> Maximum repetition period of relevant system info blocks that needs to be received by the UE

to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 67.68 s, allow 68 s for the cell re-selection delay to a higher priority NR cell and 7.68 s for the cell re-selection delay to a lower priority cell in the test case, which we allow 8 s.

## A.8.3 RRC\_CONNECTED state mobility

### A.8.3.1 Handover

### A.8.3.1.1 E-UTRAN - NR handover in FR1

### A.8.3.1.1.1 Test Purpose and Environment

This test shall verify the E-UTRAN to NR FR1 handover requirements as specified in clause 6.1.2.1 specified in clause 5.3.4 in TS 36.133 [15].

The test comprises of one E-UTRA carrier and one NR carrier. There are two cells and one cell on each carrier. Cell 1 is the E-UTRAN and Cell 2 is an inter-RAT NR neighbour cell. The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable and the UE is expected to detect and send a measurement report. Gap pattern configuration with id #0 as specified in Table 8.1.2.1-1 of TS 36.133 [15] is configured before T2 begins to enable inter-RAT frequency monitoring.

A RRC message implying handover shall be sent to the UE during period T2 after the UE has reported Event B2. The start of T3 is the instant when the last TTI containing the RRC message implying handover is sent to the UE. The handover message shall contain Cell 2 as the target cell.

Supported test configurations are shown in table A.8.3.1.1-1. General test parameters are provided in Table A.8.3.1.1-2. Cell specific test parameters for Cell 1 and Cell 2 are provided in Tables A.8.3.1.1-3 and A.8.3.1.1-4 respectively.

Table A.8.3.1.1-1: Supported test configurations for E-UTRAN inter-RAT NR handover

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

Table A.8.3.1.1-2: General test parameters for E-UTRAN inter-RAT NR handover

Pai	Parameter		Value	Comment
NR RF Channel Number			1	1 NR carrier frequency is used in the test
LTE RF Channel N	Number		2	1 E-UTRAN carrier frequency is used in the test
Initial conditions	Active cell		Cell 1	E-UTRAN cell
	Neighbouring cell		Cell 2	NR cell
Final condition	Active cell		Cell 2	
NR measurement	quantity		SS-RSRP	
E-UTRAN measur	ement quantity		RSRP	
b2-Threshold1		dBm	-84	Absolute E-UTRAN RSRP
				threshold for event B2
b2-Threshold2NR		dBm	As specified in Table	Absolute NR SS-RSRP threshold
			A.8.3.1.1-4	for event B2
Hysteresis		dB	0	
TimeToTrigger		S	0	
Filter coefficient			0	L3 filtering is not used
DRX			OFF	Non-DRX test
Access Barring Inf	ormation	-	Not sent	No additional delays in random
				access procedure
Time offset between	en cells		3 ms	Asynchronous cells
Gap pattern configuration Id			0	As specified in Table 8.1.2.1-1
				started before T2 starts [15]
T1		s	5	
T2		S	≤5	
T3		S	1	

Table A.8.3.1.1-3: Cell specific test parameters for E-UTRAN inter-RAT NR handover (Cell 1)

Parameter	Unit	Configuration		Cell 1	
		_	T1	T2	Т3
RF channel number		1, 2, 3, 4, 5, 6		2	
Duplex mode		1, 2, 3		FDD	
		4, 5, 6		TDD	
TDD special subframe configuration <sup>Note1</sup>		4, 5, 6		6	
TDD uplink-downlink configuration <sup>Note1</sup>		4, 5, 6	1		
BW <sub>channel</sub>	MHz	1, 2, 3, 4, 5, 6		5 MHz: N <sub>RB,c</sub> = 2	
				10 MHz: N <sub>RB,c</sub> = {	
			2	$0 \text{ MHz}: N_{RB,c} = 1$	00
PRACH Configuration <sup>Note2</sup>		1, 2, 3		4	
		4, 5, 6		53	
PDSCH parameters:		1, 2, 3	5 MHz: R.7 FDD		
DL Reference Measurement				10 MHz: R.3 FD	
Channel <sup>Note3</sup>				20 MHz: R.6 FD	
		4, 5, 6		5 MHz: R.4 TDE	
				10 MHz: R.0 TD	
DOELO LIDEO COLLIDE II COLL		1.0.0		20 MHz: R.3 TD	
PCFICH/PDCCH/PHICH		1, 2, 3		5 MHz: R.11 FD	
parameters:				10 MHz: R.6 FD	
DL Reference Measurement Channel <sup>Note3</sup>		4.5.0		20 MHz: R.10 FD	
Chamile		4, 5, 6		5 MHz: R.11 TD 10 MHz: R.6 TD	
				10 MHz: R.6 1D 20 MHz: R.10 TD	
OCNG Patterns <sup>Note3</sup>		1, 2, 3		20 MHz: OP.20 FD	
OCING Fallettis		1, 2, 3	10 MHz: OP.10 FDD		
			ı	U IVII IZ. OF. IU FI	טכ

			20	) MHz: OP.17 F	DD
		4, 5, 6	1	MHz: OP.9 TDI 0 MHz: OP.1 TD	D
DDCIL DA		400456		0 MHz: OP.7 TD	ט
PBCH_RA		1, 2, 3, 4, 5, 6			
PBCH_RB					
PSS_RA					
SSS_RA					
PCFICH_RB					
PHICH_RA					
PHICH_RB	dB			0	
PDCCH_RA					
PDCCH_RB					
PDSCH_RA					
PDSCH_RB					
OCNG RA <sup>Note4</sup>					
OCNG RB <sup>Note4</sup>					
N <sub>oc</sub> Note5	dBm/15kHz	1, 2, 3, 4, 5, 6		-98	
Ê <sub>s</sub> /N <sub>oc</sub>	dB	1, 2, 3, 4, 5, 6	7	7	7
Ês/Iot <sup>Note6</sup>	dB	1, 2, 3, 4, 5, 6	7	7	7
RSRP <sup>Note6</sup>	dBm/15kHz	1, 2, 3, 4, 5, 6	-91	-91	-91
SCH RP <sup>Note6</sup>	dBm/15kHz	1, 2, 3, 4, 5, 6	-91	-91	-91
Io <sup>Note6</sup>	dBm/9MHz	1, 2, 3, 4, 5, 6	-62.43	-62.43	-62.43
Propagation Condition		1, 2, 3, 4, 5, 6		AWGN	•
Antenna Configuration and					
Correlation Matrix Note7		, , -, , -, -			

- Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].
- Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211 [23].
- Note 3: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.
- Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N<sub>oc</sub> to be fulfilled.
- Note 6: Ê<sub>s</sub>/I<sub>ot</sub>, RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 7: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25].

Table A.8.3.1.1-4: Cell specific test parameters E-UTRAN inter-RAT NR handover (Cell 2)

Para	meter	Unit	Configuration	Cell 2			
				T1	T2	Т3	
RF channel numb	er		1, 2, 3, 4, 5, 6		1		
Duplex mode			1, 4		FDD		
			2, 3, 5, 6		TDD		
TDD Configuration	า		2, 5		TDDConf.1.1		
			3, 6		TDDConf.1.2		
BW <sub>channel</sub>		MHz	1, 4	10: N <sub>RB,c</sub> = 52 (FDD)			
			2, 5	10: N <sub>RB,c</sub> = 52 (TDD)			
			3, 6	40: N <sub>RB,c</sub> = 106 (TDD)			
PDSCH reference	measurement		1, 4		SR.1.1 FDD		
channel			2, 5		SR.1.1 TDD		
			3, 6		SR.2.1 TDD		
CORSET reference	ce channel		1, 4		CR.1.1 FDD		
			2, 5	CR.1.1 TDD			
			3, 6		CR.2.1 TDD		
OCNG pattern <sup>Note1</sup>			1, 2, 3, 4, 5, 6	<u> </u>	OP.1	·	
BWP	Initial DL BWP		1, 2, 3, 4, 5, 6		DLBWP.0.1		

	Dedicated DL BWP				DLBWP.1.1	
	Initial UL BWP				ULBWP.0.1	
	Dedicated UL BWP			ULBWP.1.1		
SMTC configuration	1		1, 2, 3, 4, 5, 6		SMTC.1	
SSB configuration			1, 2, 4, 5		SSB.1 FR1	
			3, 6		SSB.2 FR1	
b2-Threshold2NR		dBm	1, 2, 4, 5		-105	
		иын	3, 6		-103	
EPRE ratio of PSS			1, 2, 3, 4, 5, 6			
EPRE ratio of PBCI						
EPRE ratio of PBCI	H to					
PBCH_DMRS						
EPRE ratio of PDC	CH_DMRS to					
SSS						
	EPRE ratio of PDCCH to					
	PDCCH_DMRS			0		
EPRE ratio of PDSCH_DMRS to						
	SSS					
EPRE ratio of PDS	CH to					
PDSCH_DMRS						
EPRE ratio of OCN						
EPRE ratio of OCN	G to OCNG					
DMRS						
N <sub>oc</sub> Note2		dBm/15 KHz	1, 2, 3, 4, 5, 6		-98	
N <sub>oc</sub> Note2		dBm/SCS	1, 2, 4, 5		-98	
A (A)		ID.	3, 6	e,	-95	-
Ê <sub>s</sub> /N <sub>oc</sub> Ê <sub>s</sub> /I <sub>ot</sub> <sup>Note3</sup>		dB	1, 2, 3, 4, 5, 6	-inifinit	0	0
		dB	1, 2, 3, 4, 5, 6	-inifinit	0	0
SS-RSRP <sup>Note3</sup>		dBm/SCS	1, 2, 4, 5	-inifinit	-98	-98
		dD/0.00	3, 6	-inifinit	-95 67.04	-95 67.04
Io <sup>Note3</sup>		dBm/9.36 MHz	1, 2, 4, 5	-70.05	-67.04	-67.04
10.1886		dBm/38.16 MHz	3, 6	-63.96	-60.94	-60.94
Propagation conditi	on		1, 2, 3, 4, 5, 6		AWGN	
Antenna Configurat			1, 2, 3, 4, 5, 6	1x2 Low		
Note 1: OCNC of			<u> </u>			

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

Note 3: Ê<sub>s</sub>/I<sub>ot</sub>, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

### A.8.3.1.1.2 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 85 ms from the beginning of time period T3.

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

NOTE: The handover delay can be expressed as: RRC procedure delay + T<sub>interrupt</sub>, where:

RRC procedure delay = 50 ms and is specified in TS36.331.

 $T_{interrupt} = 210$  ms in the test;  $T_{interrupt}$  is defined in TS36.133 clause 5.3.4.3.

This gives a total of 260 ms.

### A.8.4 Measurement procedure

### A.8.4.1 E-UTRA – NR Inter-RAT SFTD Measurement Delay

### A.8.4.1.1 E-UTRA – NR Inter-RAT SFTD Measurement Delay in non-DRX

### A.8.4.1.1.1 Test Purpose and Environment

The purpose of this test is to partly verify that measurement reporting delay for SFTD between E-UTRA PCell and inter-RAT NR neighbour cell in FR1 is within the requirements stated in clauses 8.1.2.4.25 and 8.1.2.4.26 of TS 36.133 [15] for E-UTRA FDD and TDD, respectively, when no measurement gaps are provided and no DRX is configured.

The tests consist of a single time period of duration T1. Two carriers are used in the tests: one E-UTRA carrier with the PCell (Cell 1), and one NR carrier with the NR neighbour cell (Cell 2).

Prior to the start of time duration T1, the UE is connected to Cell 1 and configured to carry out intra-frequency measurements only. The point in time at which the UE receives, at the UE antenna connector(s), a RRC message containing a measurement configuration for SFTD measurements on RF channel 2 defines the start of time duration T1. Following the start of T1 the UE shall detect Cell 2, determine the SFN and frame time difference of Cell 2 relative to Cell 1, and send a measurement report.

The supported test configurations are listed in Table A.8.4.1.1.1-1 below. Test parameters and cell-specific parameters for the NR cell are provided in Tables A.8.4.1.1.1-2 and A.8.4.1.1.1-3 below, respectively. Cell-specific parameters for the E-UTRA cell are provided in Table A.3.7.2.1-1 in clause A.3.7.2.1.

Table A.8.4.1.1.1-1: Applicable E-UTRA and NR configurations for inter-RAT SFTD measurement delay test

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

Table A.8.4.1.1.1-2: Applicable E-UTRA and NR configurations for inter-RAT SFTD measurement delay test

Parameter	Unit	Test	Value		Comment
		configuration	Test 1	Test 2	
E-UTRA RF Channel		Config	,	1	One E-UTRAN TDD carrier
Number		1,2,3,4,5,6		l	frequencies is used.
NR RF Channel		Config	,	1	One NR FR1 carrier frequencies is
Number		1,2,3,4,5,6		l	used.
Active cell		Config	Ce	II 1	Cell 1 is on E-UTRA RF channel
		1,2,3,4,5,6	Ce	11 1	number 1.
Neighbour cell		Config	Co	II 2	Cell 2 is on NR RF channel number
		1,2,3,4,5,6			1.
SMTC-SSB parameters		Config 1,4	SSB.	1 FR1	As specified in clause A.3.10.1
		Config 2,5	SSB.	1 FR1	As specified in clause A.3.10.1
		Config 3,6	SSB.2	2 FR1	As specified in clause A.3.10.1
CP length		Config	Nor	mal	Applicable to both cells.
		1,2,3,4,5,6	INOI	Шаі	
DRX		Config	OI	==	DRX is not used
		1,2,3,4,5,6	Oi	Г	
Frame time offset	ms	Config 1,2,3,4			Asynchronous cells.
between serving and			3	7	The timing of Cell 2 relative to the
neighbour cells					timing of Cell 1.
	μS	Config 5,6	3		Synchronous cells.
			3		
SFN offset between		Config			SFN of Cell 2 relative to SFN of
serving and neighbour		1,2,3,4,5,6	0 1		Cell 1.
cells					
T1	s	Config	,	1	
		1,2,3,4,5,6	'		

Table A.8.4.1.1.1-3: Cell specific test parameters for Cell 2 in inter-RAT SFTD measurement delay test

Parameter	Unit	Test configuration	Cell 2
NR RF Channel Number		Config 1,2,3,4,5,6	1
Duplex mode		Config 1,4	FDD
Duplex mode		Config 2,3,5,6	TDD
		Config 1,4	10: N <sub>RB,c</sub> = 52
BWchannel	MHz	Config 2,5	10: N <sub>RB,c</sub> = 52
		Config 3,6	40: N <sub>RB,c</sub> = 106
TDD configuration		Config 2,5	TDDConf.1.1
TDD configuration		Config 3,6	TDDConf.2.1
OCNG Pattern defined in A.3.2.1.1		Config 1,2,3,4,5,6	OP.1
SMTC configuration defined		Config 1,4	SMTC.2
in A.3.2.11.1 and A.3.2.11.2		Config 2,3,5,6	SMTC.1
PDSCH/PDCCH subcarrier	Id !=	Config 1,2,4,5	15
spacing	kHz	Config 3,6	30
EPRE ratio of PSS to SSS	dB		
EPRE ratio of PBCH DMRS to SSS	dB		
EPRE ratio of PBCH to PBCH DMRS	dB	Config 1,2,3,4,5,6	0
EPRE ratio of OCNG DMRS to SSS Note 1	dB		
EPRE ratio of OCNG to OCNG DMRS Note 1	dB		
N <sub>oc</sub> Note2	dBm/15kHz		-98
Note?	-ID (0.00	Config 1,2,4,5	-98
N <sub>oc</sub> Note2	dBm/SCS	Config 3,6	-95
SS-RSRP Note 3, 4	dDm/CCC	Config 1,2,4,5	-94
33-K3KP 5, 7	dBm/SCS	Config 3,6	-91
Ê <sub>s</sub> /I <sub>ot</sub>	dB	Config 1,2,3,4,5,6	4
Ê <sub>s</sub> /N <sub>oc</sub>	dB	Config 1,2,3,4,5,6	4
I Note 3	dBm/9.36MHz	Config 1,2,4,5	-67.11
Io Note 3	dBm/38.16MHz	Config 3,6	-62.27
Propagation Condition		Config 1,2,3,4,5,6	AWGN
	1		

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

Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

### A.8.4.1.1.2 Test Requirements

Following the start of T1, the UE shall detect Cell 2 and determine the relative time difference between Cell 1 and Cell 2. At latest at  $T_{RRC\_procedure\_delay} + T_{measure\_SFTD1}$  after the beginning of time duration T1, the UE shall send a measurement report on SFTD between Cell 1 and Cell 2.

The observed rate of successful SFTD reports in repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2×TTI<sub>DCCH</sub> longer than the measurement reporting delays above due to TTI insertion uncertainty of the measurement report in DCCH.

### A.8.4.1.2 E-UTRA – NR Inter-RAT SFTD Measurement Delay in DRX

### A.8.4.1.2.1 Test Purpose and Environment

The purpose of this test is to partly verify that measurement reporting delay for SFTD between E-UTRA PCell and inter-RAT NR neighbour cell in FR1 is within the requirements stated in clauses 8.1.2.4.25 and 8.1.2.4.26 of TS 36.133 [15] for E-UTRA FDD and TDD, respectively, when no measurement gaps are provided and DRX is configured.

The tests consist of a single time period of duration T1. Two carriers are used in the tests: one E-UTRA carrier with the PCell (Cell 1), and one NR carrier with the NR neighbour cell (Cell 2).

Prior to the start of time duration T1, the UE is connected to Cell 1 and configured to carry out intra-frequency measurements only. The point in time at which the UE receives, at the UE antenna connector(s), a RRC message containing a measurement configuration for SFTD measurements on RF channel 2 defines the start of time duration T1. Following the start of T1 the UE shall detect Cell 2, determine the SFN and frame time difference of Cell 2 relative to Cell 1, and send a measurement report.

The supported test configurations are listed in Table A.8.4.1.2.1-1 below. Test parameters are provided in Tables A.8.4.1.2.1-2 below. Cell-specific parameters for the E-UTRA and NR cells are provided in Table A.3.7.2.1-1 in clause A.3.7.2.1, and Table A.8.4.1.1.1-3 in clause A.8.4.1.1.1, respectively.

Table A.8.4.1.2.1-1: Applicable E-UTRA and NR configurations for inter-RAT SFTD measurement delay test in DRX

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

Table A.8.4.1.2.1-2: Applicable E-UTRA and NR configurations for inter-RAT SFTD measurement delay test in DRX

Parameter	Unit	Test	Va	lue	Comment
		configuration	Test 1	Test 2	
E-UTRA RF Channel Number		Config 1,2,3,4,5,6		1	One E-UTRAN TDD carrier frequencies is used.
NR RF Channel Number		Config 1,2,3,4,5,6		1	One NR FR1 carrier frequencies is used.
Active cell		Config 1,2,3,4,5,6	Се	II 1	Cell 1 is on E-UTRA RF channel number 1.
Neighbour cell		Config 1,2,3,4,5,6	Се	II 2	Cell 2 is on NR RF channel number 1.
SMTC-SSB parameters		Config 1,4	SSB.1 FR1		As specified in clause A.3.10.1
		Config 2,5	SSB.1 FR1		As specified in clause A.3.10.1
		Config 3,6	SSB.2 FR1		As specified in clause A.3.10.1
CP length		Config 1,2,3,4,5,6	Nor	mal	Applicable to both cells.
DRX		Config 1,2,3,4,5,6	DR	X.4	DRX configuration as specified in clause A.3.3.4
Frame time offset between serving and neighbour cells	ms	Config 1,2,3,4	3	7	Asynchronous cells. The timing of Cell 2 relative to the timing of Cell 1.
	μs	Config 5,6	3		Synchronous cells.
SFN offset between serving and neighbour cells		Config 1,2,3,4,5,6	0	1	SFN of Cell 2 relative to SFN of Cell 1.
T1	S	Config 1,2,3,4,5,6		1	

### A.8.4.1.2.2 Test Requirements

Following the start of T1, the UE shall detect Cell 2 and determine the relative time difference between Cell 1 and Cell 2. At latest at the earliest DRX activity time following upon  $T_{RRC\_procedure\_delay} + T_{measure\_SFTD1}$  from the beginning of time duration T1, the UE shall send a measurement report on SFTD between Cell 1 and Cell 2.

The observed rate of successful SFTD reports in repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2×TTI<sub>DCCH</sub> longer than the measurement reporting delays above due to TTI insertion uncertainty of the measurement report in DCCH.

### A.8.4.2 E-UTRA – NR Inter-RAT Measurements

## A.8.4.2.1 NR Inter-RAT event triggered reporting tests for FR1 without SSB time index detection when DRX is not used

### A.8.4.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause 8.1.2.4.21 of TS 36.133 [15] for E-UTRAN FDD-NR measurements and clause 8.1.2.4.22 of TS 36.133 [15] for E-UTRAN TDD-NR measurements.

In this test, there are two cells: E-UTRA cell 1 as PCell on E-UTRA RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 1. The test parameters are given in Tables A.8.4.2.1.1-1, A.8.4.2.1.1-2, A.8.4.2.1.1-3 and A.8.4.2.1.1-4.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.8.4.2.1.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table A.8.4.2.1.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter RAT neighbour becomes better than threshold2) [16] is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

Table A.8.4.2.1.1-1: NR inter-RAT event triggered reporting tests without SSB index reading for FR1

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

Table A.8.4.2.1.1-2: General test parameters for NR inter-RAT event triggered reporting for FR1 without SSB time index detection

Parameter	Unit	Test	Value		Comment
		configurati on	Test 1	Test 2	
RF Channel Numbers		1, 2, 3, 4, 5,	2	•	One LTE and one FR1 NR carrier
		6			frequencies are used.
Active cell		1, 2, 3, 4, 5, 6	E-UTRA ce	ll 1 (PCell)	E-UTRA cell 1 is on E-UTRA RF channel number 1.
Neighbour cell		1, 2, 3, 4, 5, 6	NR cell 2		NR cell 2 is on NR RF channel number 1.
Gap Pattern Id		1, 2, 3, 4, 5, 6	0	4	As specified in clause Table 8.1.2.1-1 of TS 36.133 [15].
Measurement gap offset		1, 2, 3, 4, 5, 6	39	19	As specified in TS 36.331 [16].
b2-Threshold1	dBm	1, 2, 3, 4, 5, 6	Note 1		E-UTRA RSRP threshold for E-UTRA RSRP measurement on cell 1 for event B2 [16]
b2-Threshold2NR	dBm	1, 2, 3, 4, 5, 6	Note 2		SS-RSRP threshold for SS-RSRP measurement on cell 2 for event B2 [16]
Hysteresis	dB	1, 2, 3, 4, 5, 6	0		
CP length		1, 2, 3, 4, 5, 6	Normal		
TimeToTrigger	S	1, 2, 3, 4, 5, 6	0		
Filter coefficient		1, 2, 3, 4, 5, 6	0		L3 filtering is not used
DRX		1, 2, 3, 4, 5, 6	OFF		DRX is not used
Time offset between serving and neighbour cells		1, 4	3ms		Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		2, 3, 5, 6	3μs		Synchronous cells.
T1	S	1, 2, 3, 4, 5, 6	5		
T2	s	1, 2, 3, 4, 5, 6	1	1	

Note 2: The value of b2-Threshold2NR is defined in Table A.8.4.2.1.1-4

Table A.8.4.2.1.1-3: E-UTRAN PCell specific test parameters for NR inter-RAT event triggered reporting in non-DRX with NR neigbour cell in FR1 without SSB time index detection

Parameter	Unit	Configuration	Cell	1	
			T1	T2	
RF channel number		1, 2, 3, 4, 5, 6	1		
Duplex mode		1, 2, 3	FDD	1	
		4, 5, 6	TDD		
TDD special subframe configuration <sup>Note1</sup>		4, 5, 6	6		
TDD uplink-downlink configuration <sup>Note1</sup>		4, 5, 6	1		
BWchannel	MHz	1, 2, 3, 4, 5, 6	5 MHz: N <sub>RB,c</sub> = 25 10 MHz: N <sub>RB,c</sub> = 50 20 MHz: N <sub>RB,c</sub> = 100		
PDSCH parameters:		1, 2, 3	5 MHz: R.7 FDD 10 MHz: R.3 FDD		

DL Reference Measurement			20 MHz: R	6 FDD			
Channel <sup>Note2</sup>		4, 5, 6	5 MHz: R.				
Gildillici		4, 5, 0	10 MHz: R				
			I	z: R.3 TDD			
PCFICH/PDCCH/PHICH		1, 2, 3	5 MHz: R.11 FDD				
parameters:		1, 2, 3	10 MHz: R.6 FDD				
DL Reference Measurement			20 MHz: R.0 FDD				
Channel <sup>Note2</sup>		4, 5, 6	5 MHz: R.				
Chamile		4, 5, 0	10 MHz: R				
			20 MHz: R.	-			
OCNG Patterns <sup>Note2</sup>		1, 2, 3	5 MHz: OP.				
OONOT allerns		1, 2, 0	10 MHz: OP				
			20 MHz: OP				
		4, 5, 6	5 MHz: OP				
		4, 5, 6	10 MHz: OF	_			
			20 MHz: OF				
b2-Threshold1	dBm	1, 2, 3, 4, 5, 6	-79				
PBCH RA		1, 2, 3, 4, 5, 6					
PBCH RB		., _, 0, ., 0, 0					
PSS RA							
SSS RA							
PCFICH RB							
PHICH RA							
PHICH RB	dB		0				
PDCCH RA	_						
PDCCH RB							
PDSCH RA							
PDSCH RB							
OCNG RA <sup>Note3</sup>							
OCNG RB <sup>Note3</sup>							
N <sub>oc</sub> Note4	dBm/15kHz	1, 2, 3, 4, 5, 6	-104	]			
Ê <sub>s</sub> /N <sub>oc</sub>	dB	1, 2, 3, 4, 5, 6	-Infinity	17			
Ê <sub>s</sub> /I <sub>ot</sub> Note5	dB	1, 2, 3, 4, 5, 6	-Infinity	17			
RSRP <sup>Note5</sup>	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-87			
SCH RPNote5	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-87			
Io <sup>Note5</sup>	dBm/9MHz	1, 2, 3, 4, 5, 6	-76.22+10log (N <sub>RB,c</sub> /50) -59.13+10log (N <sub>RB,c</sub>				
Propagation Condition Note6		1, 2, 3, 4, 5, 6	/50)				
Antenna Configuration and		1, 2, 3, 4, 5, 6	ETU70 1x2 Low				
Correlation Matrix Note6		1, 2, 3, 4, 5, 6	IXZ LO	JVV			

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].

Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.

Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N<sub>oc</sub> to be fulfilled.

Note 5: Ê<sub>s</sub>/I<sub>ot</sub>, RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25].

Table A.8.4.2.1.1-4: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR1 without SSB time index detection

Parameter	Unit	Test	Cell 2		
		configuration	T1	T2	
NR RF Channel Number		1, 2, 3, 4, 5, 6		1	
Duplex mode		1, 4	FDD		
		2, 3, 5, 6		DD	
TDD configuration		2, 5	TDDC	onf.1.1	
		3, 6	TDDC	onf.2.1	
BWchannel	MHz	1, 2, 4, 5	10: N <sub>R</sub>	<sub>B,c</sub> = 52	
		3, 6		s,c = 106	
OCNG Patterns defined in A.3.2.1.1 (OP.1)		1, 2, 3, 4, 5, 6	OF	P.1	
SMTC configuration defined in A.3.11.1		1, 4	SM	ΓC.2	
and A.3.11.2		2, 3, 5, 6	SM <sup>-</sup>	ΓC.1	
PDSCH/PDCCH subcarrier spacing	kHz	1, 2, 4, 5	1	5	
		3, 6	3	60	
b2-Threshold2NR	dBm/SCS	1, 2, 4, 5	-(	99	
		3, 6	-(	96	
EPRE ratio of PSS to SSS		1, 2, 3, 4, 5, 6			
EPRE ratio of PBCH DMRS to SSS					
EPRE ratio of PBCH to PBCH DMRS					
EPRE ratio of PDCCH DMRS to SSS					
EPRE ratio of PDCCH to PDCCH DMRS			0		
EPRE ratio of PDSCH DMRS to SSS					
EPRE ratio of PDSCH to PDSCH					
EPRE ratio of OCNG DMRS to SSS (Note					
1)					
EPRE ratio of OCNG to OCNG DMRS					
(Note 1)					
$N_{oc}^{\text{Note2}}$	dBm/15kHz	1, 2, 3, 4, 5, 6	-(	98	
$N_{oc}$ Note2	dBm/SCS	1, 2, 4, 5		98	
		3, 6		95	
SS-RSRP Note 3	dBm/SCS	1, 2, 4, 5	-Infinity	-91	
		3, 6	-Infinity	-88	
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	1, 2, 3, 4, 5, 6	-Infinity	7	
$\hat{E}_s/N_{oc}$	dB	1, 2, 3, 4, 5, 6	-Infinity	7	
Io <sup>Note3</sup>	dBm/9.36MHz	1, 2, 4, 5	-Infinity	-65.38	
	dBm/38.16MH z	3, 6	-Infinity	-61.06	
Propagation Condition		1, 2, 3, 4, 5, 6	ET	U70	
Antenna Configuration and Correlation Matrix		1, 2, 3, 4, 5, 6		Low	
Note 1: OCNG shall be used such that the density is achieved for all OFDM s	symbols.			•	

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

### A.8.4.2.1.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE shall not send event triggered

Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 800 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and test 2, the UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.8.4.2.2 NR Inter-RAT event triggered reporting tests for FR1 without SSB time index detection when DRX is used

### A.8.4.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause 8.1.2.4.21 of TS 36.133 [15] for E-UTRAN FDD-NR measurements and clause 8.1.2.4.22 of TS 36.133 [15] for E-UTRAN TDD-NR measurements.

In this test, there are two cells: E-UTRA cell 1 as PCell on E-UTRA RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 1. The test parameters are given in Tables A.8.4.2.2.1-1, A.8.4.2.2.1-2, A.8.4.2.2.1-3 and A.8.4.2.2.1-4.

In tests 1 and 2, measurement gap pattern configuration # 0 as defined in Table A.8.4.2.2.1-2 is provided for UE that does not support per-FR gap and in tests 3 and 4, measurement gap pattern configuration #4 as defined in Table A.8.4.2.2.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter RAT neighbour becomes better than threshold2) [16] is used. In the measurement configuration the UE shall be indicated to report the SSB index of the identified NR cell. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

Table A.8.4.2.2.1-1: NR inter-RAT event triggered reporting tests without SSB index reading for FR1

Configuration	Description
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note 1: The UE is only r	equired to be tested in one of the supported test configurations.

Table A.8.4.2.2.1-2: General test parameters for NR inter-RAT event triggered reporting for FR1 without SSB time index detection

Parameter	Unit	Test	Value				Comment	
		configuratio	Test	Test 2	Test	Test 4		
DE Obassasi		n	1		2		On a LTE and A EDA ND a smith	
RF Channel Number		1, 2, 3, 4, 5, 6		4	2		One LTE and 1 FR1 NR carrier frequencies are used.	
Active cell		1, 2, 3, 4, 5,	F-HTR/	A cell 1 (PC	الم`		E-UTRA cell 1 is on E-UTRA RF	
Active cell		6	L-0110	1 0011 1 (1 0	JCII)		channel number 1.	
Neighbour cell		1, 2, 3, 4, 5,	NR cell	2			NR cell 2 is on NR RF channel number	
ŭ		6					1.	
Gap Pattern Id		1, 2, 3, 4, 5,	0		4		As specified in clause Table 8.1.2.1-1	
Measurement gap		6 1, 2, 3, 4, 5,	39		19		of TS 36.133 [15]. As specified in TS 36.331 [16].	
offset		6	39		19		As specified in 13 30.331 [10].	
b2-Threshold1	dB	1, 2, 3, 4, 5,	Note 1		•		E-UTRA RSRP threshold for E-UTRA	
	m	6					RSRP measurement on cell 1 for event B2 [16]	
b2-Threshold2NR	dB	1, 2, 3, 4, 5,	Note 2				SS-RSRP threshold for SS-RSRP	
	m	6					measurement on cell 2 for event B2 [16]	
Hysteresis	dB	1, 2, 3, 4, 5, 6	0					
CP length		1, 2, 3, 4, 5, 6	Normal					
TimeToTrigger	S	1, 2, 3, 4, 5, 6	0					
Filter coefficient		1, 2, 3, 4, 5, 6	0				L3 filtering is not used	
DRX		1, 2, 3, 4, 5, 6	DRX. 9	DRX.10	DRX. 9	DRX.10	As specified in clause A.3.3	
Time offset		1, 4	3ms		] 3		Asynchronous cells.	
between serving		-, .					The timing of Cell 2 is 3ms later than	
and neighbour			,				the timing of Cell 1.	
cells		2, 3, 5, 6	3μs				Synchronous cells.	
T1	S	1, 2, 3, 4, 5, 6	5					
T2	S	1, 2, 3, 4, 5, 6	2	11	2	11		
Note 1: The value of b2-Threshold1 is defined in Table A.8.4.2.2.1-3								

Note 1: The value of b2-Threshold1 is defined in Table A.8.4.2.2.1-3

Note 2: The value of b2-Threshold2NR is defined in Table A.8.4.2.2.1-4

Table A.8.4.2.2.1-3: E-UTRAN PCell specific test parameters for NR inter-RAT event triggered reporting in non-DRX with NR neighbour cell in FR1 without SSB time index detection

Parameter	Unit	Configuration	Cell '		
			T1	T2	
RF channel number		1, 2, 3, 4, 5, 6	1		
Duplex mode		1, 2, 3	FDD		
		4, 5, 6	TDD		
TDD special subframe configuration <sup>Note1</sup>		4, 5, 6	6		
TDD uplink-downlink configuration <sup>Note1</sup>		4, 5, 6	1		
BWchannel	MHz	1, 2, 3, 4, 5, 6	5 MHz: $N_{RB,c}$ = 25 10 MHz: $N_{RB,c}$ = 50 20 MHz: $N_{RB,c}$ = 100		
PDSCH parameters:		1, 2, 3	5 MHz: R.7 FDD		

DL Reference Measurement			10 MHz: R		
Channel <sup>Note2</sup>		4.5.0	20 MHz: R		
		4, 5, 6	5 MHz: R.		
			10 MHz: R		
POFICI I/PD COLL/PLUCIA		4.0.0	20 MHz: R		
PCFICH/PDCCH/PHICH		1, 2, 3	5 MHz: R.1		
parameters:			10 MHz: R	-	
DL Reference Measurement Channel <sup>Note2</sup>		4.5.0	20 MHz: R.		
Channel		4, 5, 6	5 MHz: R.′ 10 MHz: R		
OCNG Patterns <sup>Note2</sup>		1, 2, 3	20 MHz: R. 5 MHz: OP.		
OCING Patterns 1982		1, 2, 3	5 МП2. ОР. 10 MHz: ОР		
		4, 5, 6	20 MHz: OP.17 FDD 5 MHz: OP.9 TDD		
		4, 5, 6	10 MHz: OP.9 TDD		
			20 MHz: OP.1 TDD		
b2-Threshold1	dBm	1, 2, 3, 4, 5, 6	-79		
PBCH RA	dDill	1, 2, 3, 4, 5, 6	-13		
PBCH RB		1, 2, 0, 4, 0, 0			
PSS RA					
SSS RA					
PCFICH RB					
PHICH RA					
PHICH RB	dB		0		
PDCCH RA			· ·		
PDCCH RB					
PDSCH RA					
PDSCH RB					
OCNG RA <sup>Note3</sup>					
OCNG RB <sup>Note3</sup>					
N <sub>oc</sub> Note4	dBm/15kHz	1, 2, 3, 4, 5, 6	-104	1	
Ê <sub>s</sub> /N <sub>oc</sub>	dB	1, 2, 3, 4, 5, 6	-Infinity	17	
Ê <sub>s</sub> /I <sub>ot</sub> Note5	dB	1, 2, 3, 4, 5, 6	-Infinity	17	
RSRP <sup>Note5</sup>	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-87	
SCH RPNote5	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity -87		
Io <sup>Note5</sup>	dBm/9MHz	1, 2, 3, 4, 5, 6	-76.22+10log (N <sub>RB,c</sub> /50) -59.13+10log (N <sub>RB,c</sub> /50)		
Propagation Condition Note6		1, 2, 3, 4, 5, 6	ETU70		
Antenna Configuration and Correlation Matrix Note6		1, 2, 3, 4, 5, 6	1x2 Lo		
CO C.C.GOTT ITTIGUTA	ı	I			

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].

Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.

Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N<sub>oc</sub> to be fulfilled.

Note 5: Ê<sub>s</sub>/I<sub>ot</sub>, RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25].

Table A.8.4.2.2.1-4: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR1 without SSB time index detection

Parameter	Unit	Test	Ce	12
		configuration	T1	T2
NR RF Channel Number		1, 2, 3, 4, 5, 6	1	
Duplex mode		1, 4	FDD	
		2, 3, 5, 6	TC	)D
TDD configuration		2, 5	TDDConf.1.1	
		3, 6	TDDC	onf.2.1
BWchannel	MHz	1, 2, 4, 5	10: N <sub>RE</sub>	<sub>3,c</sub> = 52
		3, 6	40: N <sub>RB</sub>	
OCNG Patterns defined in A.3.2.1.1 (OP.1)		1, 2, 3, 4, 5, 6	OF	P.1
SMTC configuration defined in A.3.11.1		1, 4	SMT	C.2
and A.3.11.2		2, 3, 5, 6	SMT	C.1
PDSCH/PDCCH subcarrier spacing	kHz	1, 2, 4, 5	1	5
		3, 6	3	0
b2-Threshold2NR	dBm/SCS	1, 2, 4, 5	-9	9
		3, 6	-9	6
EPRE ratio of PSS to SSS		1, 2, 3, 4, 5, 6		
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS			(	)
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS (Note				
1)				
EPRE ratio of OCNG to OCNG DMRS				
(Note 1)				
$N_{oc}^{Note2}$	dBm/15kHz	1, 2, 3, 4, 5, 6	-9	8
$N_{oc}^{ m Note2}$	dBm/SCS	1, 2, 4, 5	- <u>ç</u>	8
Toc		3, 6	_g	
SS-RSRP Note 3	dBm/SCS	1, 2, 4, 5	-Infinity	-91
		3, 6	-Infinity	-88
$\hat{E}_s/I_{ot}$	dB	1, 2, 3, 4, 5, 6	-Infinity	7
$\hat{E}_s/N_{oc}$	dB	1, 2, 3, 4, 5, 6	-Infinity	7
IoNote3	dBm/9.36MHz	1, 2, 4, 5	-Infinity	-65.38
	dBm/38.16MH	3, 6	-Infinity	-61.06
	Z	5,5		01.00
Propagation Condition	_	1, 2, 3, 4, 5, 6	ETI	J70
Antenna Configuration and Correlation		1, 2, 3, 4, 5, 6 1, 2, 3, 4, 5, 6	1x2 Low	
Matrix		, , -, -, -, -	-/-	

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

Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

# A.8.4.2.2.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 1080 ms from the beginning of time period T2. The UE shall not send event triggered

measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 10240 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 1080 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 10240 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In tests 1, 2, 3 and 4, the UE is not required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.8.4.2.3 NR Inter-RAT event triggered reporting tests for FR1 with SSB time index detection when DRX is not used

#### A.8.4.2.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause 8.1.2.4.21 of TS 36.133 [15] for E-UTRAN FDD-NR measurements and clause 8.1.2.4.22 of TS 36.133 [15] for E-UTRAN TDD-NR measurements.

In this test, there are two cells: E-UTRA cell 1 as PCell on E-UTRA RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 1. The test parameters are given in Tables A.8.4.2.3.1-1, A.8.4.2.3.1-2, A.8.4.2.3.1-3 and A.8.4.2.3.1-4.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.8.4.2.3.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table A.8.4.2.3.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter RAT neighbour becomes better than threshold2) [16] is used. In the measurement configuration the UE shall be indicated to report the SSB index of the identified NR cell. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

Table A.8.4.2.3.1-1: NR inter-RAT event triggered reporting tests without SSB index reading for FR1

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

Table A.8.4.2.3.1-2: General test parameters for NR inter-RAT event triggered reporting for FR1 without SSB time index detection

Parameter	Unit Test		V	/alue	Comment
		configurati on	Test 1	Test 2	
RF Channel Numbers		1, 2, 3, 4, 5,		2	One LTE and one FR1 NR carrier
		6			frequencies are used.
Active cell		1, 2, 3, 4, 5, 6	E-UTRA ce	ell 1 (PCell)	E-UTRA cell 1 is on E-UTRA RF channel number 1.
Neighbour cell		1, 2, 3, 4, 5, 6	NR cell 2		NR cell 2 is on NR RF channel number 1.
Gap Pattern Id		1, 2, 3, 4, 5, 6	0	4	As specified in clause Table 8.1.2.1-1 of TS 36.133 [15].
Measurement gap offset		1, 2, 3, 4, 5, 6	39	19	As specified in TS 36.331 [16].
b2-Threshold1	dBm	1, 2, 3, 4, 5, 6	Note 1		E-UTRA RSRP threshold for E-UTRA RSRP measurement on cell 1 for event B2 [16]
b2-Threshold2NR	dBm	1, 2, 3, 4, 5, 6	Note 2		SS-RSRP threshold for SS-RSRP measurement on cell 2 for event B2 [16]
Hysteresis	dB	1, 2, 3, 4, 5, 6	0		
CP length		1, 2, 3, 4, 5, 6	Normal		
TimeToTrigger	s	1, 2, 3, 4, 5, 6	0		
Filter coefficient		1, 2, 3, 4, 5, 6	0		L3 filtering is not used
DRX		1, 2, 3, 4, 5, 6	OFF		DRX is not used
Time offset between serving and neighbour cells		1, 4	3ms		Asynchronous cells. The timing of Cell 2 is 3 ms later than the timing of Cell 1.
		2, 3, 5, 6	3μs		Synchronous cells.
T1	S	1, 2, 3, 4, 5, 6	5		
T2	S	1, 2, 3, 4, 5, 6	2	1	

Note 1: The value of b2-Threshold1 is defined in Table A.8.4.2.3.1-3

Note 2: The value of b2-Threshold2NR is defined in Table A.8.4.2.3.1-4

Table A.8.4.2.3.1-3: E-UTRAN PCell specific test parameters for NR inter-RAT event triggered reporting in non-DRX with NR neigbour cell in FR1 without SSB time index detection

Parameter	Unit	Configuration	Cell 1		
			T1	T2	
RF channel number		1, 2, 3, 4, 5, 6	1		
Duplex mode		1, 2, 3	FDD		
		4, 5, 6	TDD		
TDD special subframe configuration <sup>Note1</sup>		4, 5, 6	6		
TDD uplink-downlink configuration <sup>Note1</sup>		4, 5, 6	1		
BWchannel	MHz	1, 2, 3, 4, 5, 6	5 MHz: N <sub>RB,c</sub> = 25 10 MHz: N <sub>RB,c</sub> = 50 20 MHz: N <sub>RB,c</sub> = 100		
PDSCH parameters:		1, 2, 3	5 MHz: R.7 FDD		

DI Defenence Messurement			10 MHz: R	2 EDD	
DL Reference Measurement Channel <sup>Note2</sup>			20 MHz: R		
Chamier		4, 5, 6	5 MHz: R.		
		4, 5, 6	10 MHz: R	– –	
			20 MHz: R		
PCFICH/PDCCH/PHICH		1, 2, 3	5 MHz: R.		
parameters:		1, 2, 3	5 МП2. К. 10 MHz: R		
DL Reference Measurement			20 MHz: R.10 FDD		
Channel <sup>Note2</sup>		4, 5, 6	5 MHz: R.11 TDD		
Chamile		4, 5, 6	10 MHz: R		
			20 MHz: R.	-	
OCNG Patterns <sup>Note2</sup>		1, 2, 3	5 MHz: OP.		
OCING Fatterns		1, 2, 3	10 MHz: OP		
			20 MHz: OP	-	
		4, 5, 6	5 MHz: OP		
		4, 5, 6	10 MHz: OF		
			20 MHz: OP.7 TDD		
b2-Threshold1	dBm	1, 2, 3, 4, 5, 6	-79		
PBCH RA		1, 2, 3, 4, 5, 6			
PBCH RB		., _, 0, ., 0, 0			
PSS RA					
SSS RA					
PCFICH RB					
PHICH RA					
PHICH RB	dB		0		
PDCCH RA	-		· ·		
PDCCH RB					
PDSCH RA					
PDSCH RB					
OCNG RA <sup>Note3</sup>					
OCNG RB <sup>Note3</sup>					
Noc Note4	dBm/15kHz	1, 2, 3, 4, 5, 6	-104	ļ	
Ê <sub>s</sub> /N <sub>oc</sub>	dB	1, 2, 3, 4, 5, 6	-Infinity 17		
Ês/Iot <sup>Note5</sup>	dB	1, 2, 3, 4, 5, 6	-Infinity 17		
RSRP <sup>Note5</sup>	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-87	
SCH RPNote5	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-87	
Io <sup>Note5</sup>	dBm/9MHz	1, 2, 3, 4, 5, 6	-76.22+10log (N <sub>RB,c</sub> /50) -59.13+10log (N <sub>RB,c</sub> /50)		
Propagation Condition Note6		1, 2, 3, 4, 5, 6	ETU70		
Antenna Configuration and		1, 2, 3, 4, 5, 6	1x2 Lo		
Correlation Matrix Note6			INC LOW		

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].

Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.

Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.

Note 5: Ê<sub>s</sub>/I<sub>ot</sub>, RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25].

Table A.8.4.2.3.1-4: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR1 without SSB time index detection

NR RF Channel Number	Parameter	Unit	Test	Cell 2	
NR RF Channel Number					
Duplex mode	NR RF Channel Number			1	
TDD configuration				FC	D
TDD configuration	•		2, 3, 5, 6	TC	D
Section   Sect	TDD configuration				
BWchannel	•				
Section   Sect	BWchannel	MHz			
OCNG Patterns defined in A.3.2.1.1 (OP.1)         1, 2, 3, 4, 5, 6         OP.1           SMTC configuration defined in A.3.11.1 and A.3.11.2         1, 4         SMTC.2           PDSCH/PDCCH subcarrier spacing         kHz         1, 2, 4, 5         SMTC.1           PDSCH/PDCCH subcarrier spacing         kHz         1, 2, 4, 5         15           3, 6         30         30         30           b2-Threshold2NR         dBm/SCS         1, 2, 4, 5         -99           3, 6         -96         -96           EPRE ratio of PSS to SSS         EPRE ratio of PBCH DMRS to SSS         1, 2, 3, 4, 5, 6           EPRE ratio of PDCH DMRS to SSS         EPRE ratio of PDCH DMRS to SSS         6           EPRE ratio of PDSCH bord to PDSCH         6         -98           EPRE ratio of OCNG DMRS to SSS (Note 1)         1         -98           1)         2         -98           EPRE ratio of OCNG to OCNG DMRS (Note 1)         1         -98           Noc         4         -98           Noc         4         -98           SS-RSRP Note 3         4         -98           SS-RSRP Note 3         4         -98           SS-RSRP Note 3         4         -98           By Note 3         4					
And A.3.11.2	OCNG Patterns defined in A.3.2.1.1 (OP.1)				
And A.3.11.2	SMTC configuration defined in A.3.11.1	†	1, 4	SMT	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	and A.3.11.2				
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	PDSCH/PDCCH subcarrier spacing	kHz			
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	T BOOT IT BOOT CABOATTON SPACE	15.12			
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	b2-Threshold2NR	dBm/SCS			
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$					
$ \begin{array}{ c c c c c c c c } \hline EPRE \ ratio \ of \ PBCH \ DMRS \ to \ SSS \\ \hline EPRE \ ratio \ of \ PBCH \ to \ PBCH \ DMRS \ to \ SSS \\ \hline EPRE \ ratio \ of \ PDCCH \ DMRS \ to \ SSS \\ \hline EPRE \ ratio \ of \ PDCCH \ DMRS \ to \ SSS \\ \hline EPRE \ ratio \ of \ PDSCH \ to \ PDSCH \\ \hline EPRE \ ratio \ of \ PDSCH \ to \ PDSCH \\ \hline EPRE \ ratio \ of \ OCNG \ DMRS \ to \ SSS \ (Note \ 1) \\ \hline EPRE \ ratio \ of \ OCNG \ DMRS \ to \ SSS \ (Note \ 1) \\ \hline N_{oc} \ ^{Note2} \ & dBm/15kHz \ & 1, 2, 3, 4, 5, 6 \ & -98 \\ \hline N_{oc} \ ^{Note2} \ & dBm/SCS \ & 1, 2, 4, 5 \ & -98 \\ \hline SS-RSRP \ ^{Note2} \ & dBm/SCS \ & 1, 2, 4, 5 \ & -98 \\ \hline SS-RSRP \ ^{Note3} \ & dBm/SCS \ & 1, 2, 4, 5 \ & -1nfinity \ & -91 \\ \hline 3, 6 \ & -1nfinity \ & -88 \\ \hline E_{,}/I_{oc} \ & dB \ & 1, 2, 3, 4, 5, 6 \ & -1nfinity \ & 7 \\ \hline Io^{Note3} \ & dBm/9.36MHz \ & 1, 2, 4, 5 \ & -1nfinity \ & -65.38 \\ \hline dBm/38.16MH \ & 3, 6 \ & -1nfinity \ & -61.06 \\ \hline Propagation \ Condition \ & 1, 2, 3, 4, 5, 6 \ & ETU70 \\ \hline Antenna \ Configuration \ and \ Correlation \ & 1, 2, 3, 4, 5, 6 \ & 1x2 \ Low \\ \hline \end{array}$	EPRE ratio of PSS to SSS				<u>-</u>
$ \begin{array}{ c c c c c c c } \hline EPRE \ ratio \ of \ PBCH \ to \ PBCH \ DMRS \ EPRE \ ratio \ of \ PDCCH \ DMRS \ to \ SSS \ EPRE \ ratio \ of \ PDSCH \ DMRS \ to \ SSS \ EPRE \ ratio \ of \ PDSCH \ DMRS \ to \ SSS \ EPRE \ ratio \ of \ PDSCH \ to \ PDSCH \ EPRE \ ratio \ of \ OCNG \ DMRS \ to \ SSS \ (Note \ 1) \ & & & & & & & & & & & & & & & & & & $			., _, -, -, -		
$ \begin{array}{ c c c c c c } \hline EPRE \ ratio \ of \ PDCCH \ DMRS \ to \ SSS \\ \hline EPRE \ ratio \ of \ PDCCH \ to \ PDCCH \ DMRS \ to \ SSS \\ \hline EPRE \ ratio \ of \ PDSCH \ DMRS \ to \ SSS \\ \hline EPRE \ ratio \ of \ PDSCH \ to \ PDSCH \\ \hline EPRE \ ratio \ of \ OCNG \ DMRS \ to \ SSS \ (Note \ 1) \\ \hline N_{oc}^{\ \ Note2} & dBm/15kHz & 1, 2, 3, 4, 5, 6 & -98 \\ \hline N_{oc}^{\ \ Note2} & dBm/SCS & 1, 2, 4, 5 & -98 \\ \hline S-RSRP^{\ \ Note \ 3} & dBm/SCS & 1, 2, 4, 5 & -98 \\ \hline S-RSRP^{\ \ Note \ 3} & dBm/SCS & 1, 2, 4, 5 & -Infinity & -91 \\ \hline 3, 6 & -Infinity & -88 \\ \hline E_{s}/I_{ut} & dB & 1, 2, 3, 4, 5, 6 & -Infinity & 7 \\ \hline Io^{Note \ 3} & dBm/9.36MHz & 1, 2, 4, 5 & -Infinity & -65.38 \\ \hline dBm/9.36MHz & 1, 2, 4, 5 & -Infinity & -65.38 \\ \hline dBm/38.16MH & 3, 6 & -Infinity & -61.06 \\ \hline Propagation \ \ Condition & 1, 2, 3, 4, 5, 6 & ETU70 \\ \hline Antenna \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $					
$ \begin{array}{ c c c c c c c } \hline EPRE \ ratio \ of \ PDCCH \ to \ PDCCH \ DMRS \ to \ SSS \\ \hline EPRE \ ratio \ of \ PDSCH \ to \ PDSCH \\ \hline EPRE \ ratio \ of \ OCNG \ DMRS \ to \ SSS \ (Note \ 1) \\ \hline EPRE \ ratio \ of \ OCNG \ to \ OCNG \ DMRS \ (Note \ 1) \\ \hline N_{oc}^{\ \ Note \ 2} \\ \hline N_{oc}^{\ \ \ Note \ 2} \\ \hline SS-RSRP^{\ \ Note \ 3} \\ \hline SS-RSRP^{\ \ Note \ 3} \\ \hline ES-RSRP^{\ \ \ \ Note \ 3} \\ \hline ES-RSRP^{\ \ \ \ Note \ 3} \\ \hline ES-RSRP^{\ \ \ \ \  \  \  \  \  \  \  \  \  \  \$					
$ \begin{array}{ c c c c c c } \hline EPRE \ ratio \ of \ PDSCH \ DMRS \ to \ SSS \\ \hline EPRE \ ratio \ of \ PDSCH \ to \ PDSCH \\ \hline EPRE \ ratio \ of \ OCNG \ DMRS \ to \ SSS \ (Note \ 1) \\ \hline EPRE \ ratio \ of \ OCNG \ DMRS \ to \ SSS \ (Note \ 1) \\ \hline EPRE \ ratio \ of \ OCNG \ DMRS \ to \ SSS \ (Note \ 1) \\ \hline \hline EPRE \ ratio \ of \ OCNG \ DMRS \ to \ SSS \ (Note \ 1) \\ \hline \hline N_{oc}^{\ \ Note2} & dBm/15kHz & 1, 2, 3, 4, 5, 6 & -98 \\ \hline N_{oc}^{\ \ \ Note2} & dBm/SCS & 1, 2, 4, 5 & -98 \\ \hline 3, 6 & -95 \\ \hline SS-RSRP^{\ \ Note \ 3} & dBm/SCS & 1, 2, 4, 5 & -Infinity & -91 \\ \hline 3, 6 & -Infinity & -88 \\ \hline \hline $\hat{E}_s/I_{oc}$ & dB & 1, 2, 3, 4, 5, 6 & -Infinity & 7 \\ \hline $\hat{E}_s/N_{oc}$ & dB & 1, 2, 3, 4, 5, 6 & -Infinity & 7 \\ \hline $lo^{Note3}$ & dBm/38.16MH & 3, 6 & -Infinity & -65.38 \\ \hline \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \$					
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		+		0	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		†			
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		†			
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$					
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	EPRE ratio of OCNG to OCNG DMRS				
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	(Note 1)				
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	$N_{ac}$ Note2	dBm/15kHz	1, 2, 3, 4, 5, 6	-9	8
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	N Note2	dBm/SCS	1, 2, 4, 5	-9	8
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$					
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	SS-RSRP Note 3	dBm/SCS	1, 2, 4, 5	-Infinity	-91
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$				-Infinity	-88
dBm/9.36MHz	$\hat{E}_s/I_{ot}$	dB	1, 2, 3, 4, 5, 6		7
Columbia		dB	1, 2, 3, 4, 5, 6	-Infinity	7
dBm/38.16MH         3, 6         -Infinity         -61.06           Propagation Condition         1, 2, 3, 4, 5, 6         ETU70           Antenna Configuration and Correlation         1, 2, 3, 4, 5, 6         1x2 Low	Io <sup>Note3</sup>	dBm/9.36MHz	1, 2, 4, 5	-Infinity	-65.38
Z         Z           Propagation Condition         1, 2, 3, 4, 5, 6         ETU70           Antenna Configuration and Correlation         1, 2, 3, 4, 5, 6         1x2 Low		dBm/38.16MH			
Antenna Configuration and Correlation 1, 2, 3, 4, 5, 6 1x2 Low			·		
Antenna Configuration and Correlation 1, 2, 3, 4, 5, 6 1x2 Low			1, 2, 3, 4, 5, 6	ETL	J70
			1, 2, 3, 4, 5, 6		

Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectra density is achieved for all OFDM symbols.

# A.8.4.2.3.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 1040 ms from the beginning of time period T2. The UE shall not send event triggered

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

Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and test 2, the UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.8.4.2.4 NR Inter-RAT event triggered reporting tests for FR1 with SSB time index detection when DRX is used

# A.8.4.2.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause 8.1.2.4.21 of TS 36.133 [15] for E-UTRAN FDD-NR measurements and clause 8.1.2.4.22 of TS 36.133 [15] for E-UTRAN TDD-NR measurements.

In this test, there are two cells: E-UTRA cell 1 as PCell on E-UTRA RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 1. The test parameters are given in Tables A.8.4.2.4.1-1, A.8.4.2.4.1-2, A.8.4.2.4.1-3 and A.8.4.2.4.1-4.

In tests 1 and 2, measurement gap pattern configuration # 0 as defined in Table A.8.4.2.4.1-2 is provided for UE that does not support per-FR gap and in tests 3 and 4, measurement gap pattern configuration #4 as defined in Table A.8.4.2.4.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter RAT neighbour becomes better than threshold2) [16] is used. In the measurement configuration the UE shall be indicated to report the SSB index of the identified NR cell. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

Table A.8.4.2.4.1-1: NR inter-RAT event triggered reporting tests without SSB index reading for FR1

Configuration	Description					
1	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode					
2	LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode					
3	LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode					
4	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode					
5	LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode					
6	LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode					
Note 1: The UE is only r						

Table A.8.4.2.4.1-2: General test parameters for NR inter-RAT event triggered reporting for FR1 without SSB time index detection

Parameter	Unit	Test	Value			Comment	
		configuratio	Test	Test 2	Test	Test 4	
		n	1		2		
RF Channel		1, 2, 3, 4, 5,		2	2		One LTE and 1 FR1 NR carrier
Number		6					frequencies are used.
Active cell		1, 2, 3, 4, 5,	E-UTR	A cell 1 (PC	Cell)		E-UTRA cell 1 is on E-UTRA RF
		6					channel number 1.
Neighbour cell		1, 2, 3, 4, 5, 6	NR cell	2			NR cell 2 is on NR RF channel number 1.
Gap Pattern Id		1, 2, 3, 4, 5, 6	0		4		As specified in clause Table 8.1.2.1-1 of TS 36.133 [15].
Measurement gap offset		1, 2, 3, 4, 5, 6	39		19		As specified in TS 36.331 [16].
b2-Threshold1	dB	1, 2, 3, 4, 5,	Note 1				E-UTRA RSRP threshold for E-UTRA
	m	6					RSRP measurement on cell 1 for event B2 [16]
b2-Threshold2NR	dB	1, 2, 3, 4, 5,	Note 2				SS-RSRP threshold for SS-RSRP
	m	6					measurement on cell 2 for event B2
Hysteresis	dB	1, 2, 3, 4, 5, 6	0				
CP length		1, 2, 3, 4, 5, 6	Normal				
TimeToTrigger	S	1, 2, 3, 4, 5, 6	0				
Filter coefficient		1, 2, 3, 4, 5, 6	0				L3 filtering is not used
DRX		1, 2, 3, 4, 5, 6	DRX. 9	DRX.10	DRX. 9	DRX.10	As specified in clause A.3.3
Time offset		1, 4	3ms	•		•	Asynchronous cells.
between serving							The timing of Cell 2 is 3ms later than
and neighbour							the timing of Cell 1.
cells		2, 3, 5, 6	3μs				Synchronous cells.
T1	S	1, 2, 3, 4, 5, 6	5				
T2	S	1, 2, 3, 4, 5, 6	2	13	2	13	
Note 1: The value	e of h2-	Threshold1 is de	efined in	Table A 8 4	1241-3		•

Note 1: The value of b2-Threshold1 is defined in Table A.8.4.2.4.1-3

Note 2: The value of b2-Threshold2NR is defined in Table A.8.4.2.4.1-4

Table A.8.4.2.4.1-3: E-UTRAN PCell specific test parameters for NR inter-RAT event triggered reporting in non-DRX with NR neighbour cell in FR1 without SSB time index detection

Parameter	Unit	Configuration	Cell '	
			T1	T2
RF channel number		1, 2, 3, 4, 5, 6	1	
Duplex mode		1, 2, 3	FDD	
		4, 5, 6	TDD	
TDD special subframe configuration <sup>Note1</sup>		4, 5, 6	6	
TDD uplink-downlink configuration <sup>Note1</sup>		4, 5, 6	1	
BW <sub>channel</sub>	MHz	1, 2, 3, 4, 5, 6	5 MHz: N <sub>RE</sub>	
			10 MHz: N <sub>R</sub>	<sub>B,c</sub> = 50
			20 MHz: Nre	<sub>i,c</sub> = 100
PDSCH parameters:		1, 2, 3	5 MHz: R.7	' FDD

DI Deference Macassirement			10 MHz: R	2 EDD	
DL Reference Measurement Channel <sup>Note2</sup>			20 MHz: R		
Chamiler		4, 5, 6	5 MHz: R.		
		4, 5, 6	5 MHz. R. 10 MHz: R		
			20 MHz: R		
PCFICH/PDCCH/PHICH		1, 2, 3	5 MHz: R.		
parameters:		1, 2, 3	5 МП2. К. 10 MHz: R		
DL Reference Measurement			20 MHz: R.10 FDD		
Channel <sup>Note2</sup>		4, 5, 6	5 MHz: R.11 TDD		
Chamile		4, 5, 6	10 MHz: R		
			20 MHz: R.	-	
OCNG Patterns <sup>Note2</sup>		1, 2, 3	5 MHz: OP.		
OCING Fatterns		1, 2, 3	10 MHz: OP		
			20 MHz: OP	-	
		4, 5, 6	5 MHz: OP		
		4, 5, 6	10 MHz: OF		
			20 MHz: OP.7 TDD		
b2-Threshold1	dBm	1, 2, 3, 4, 5, 6	-79		
PBCH RA	u.b.iii	1, 2, 3, 4, 5, 6			
PBCH RB		., _, 0, ., 0, 0			
PSS RA					
SSS RA					
PCFICH RB					
PHICH RA					
PHICH RB	dB		0		
PDCCH RA			· ·		
PDCCH RB					
PDSCH RA					
PDSCH RB					
OCNG RA <sup>Note3</sup>					
OCNG RB <sup>Note3</sup>					
N <sub>oc</sub> Note4	dBm/15kHz	1, 2, 3, 4, 5, 6	-104	1	
Ês/Noc	dB	1, 2, 3, 4, 5, 6	-Infinity 17		
Ês/Iot <sup>Note5</sup>	dB	1, 2, 3, 4, 5, 6	-Infinity 17		
RSRP <sup>Note5</sup>	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-87	
SCH RPNote5	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-87	
Io <sup>Note5</sup>	dBm/9MHz	1, 2, 3, 4, 5, 6	-76.22+10log (N <sub>RB,c</sub> /50) -59.13+10log (N <sub>RB,c</sub> /50)		
Propagation Condition Note6		1, 2, 3, 4, 5, 6	ETU70		
Antenna Configuration and		1, 2, 3, 4, 5, 6	1x2 Lo		
Correlation Matrix Note6					

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].

Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.

Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N<sub>oc</sub> to be fulfilled.

Note 5:  $\hat{E}_s/I_{ot}$ , RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 6: Propagation condition and correlation matrix are defined in clause B.2 in TS 36.101 [25].

Table A.8.4.2.4.1-4: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR1 without SSB time index detection

Parameter	Unit	Test	Cell 2			
		configuration	T1	T2		
NR RF Channel Number		1, 2, 3, 4, 5, 6	•			
Duplex mode		1, 4	F	)D		
		2, 3, 5, 6	TE	DD		
TDD configuration		2, 5	TDDC	onf.1.1		
		3, 6		onf.2.1		
BW <sub>channel</sub>	MHz	1, 2, 4, 5	10: N <sub>R</sub>	<sub>3,c</sub> = 52		
		3, 6	40: N <sub>RB</sub>	,c = 106		
OCNG Patterns defined in A.3.2.1.1 (OP.1)		1, 2, 3, 4, 5, 6	OF			
SMTC configuration defined in A.3.11.1		1, 4	SM	TC.2		
and A.3.11.2		2, 3, 5, 6	SM	ГС.1		
PDSCH/PDCCH subcarrier spacing	kHz	1, 2, 4, 5	1	5		
		3, 6	3	0		
b2-Threshold2NR	dBm/SCS	1, 2, 4, 5	-6	9		
		3, 6	-6	06		
EPRE ratio of PSS to SSS		1, 2, 3, 4, 5, 6				
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS			(	)		
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS (Note						
1)						
EPRE ratio of OCNG to OCNG DMRS						
(Note 1)						
$N_{oc}^{ m Note2}$	dBm/15kHz	1, 2, 3, 4, 5, 6	-6	8		
$N_{oc}^{ m Note2}$	dBm/SCS	1, 2, 4, 5	-6	08		
		3, 6	-6	)5		
SS-RSRP Note 3	dBm/SCS	1, 2, 4, 5	-Infinity	-91		
		3, 6	-Infinity	-88		
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$	dB	1, 2, 3, 4, 5, 6	-Infinity	7		
$\hat{E}_s/N_{oc}$	dB	1, 2, 3, 4, 5, 6	-Infinity	7		
Io <sup>Note3</sup>	dBm/9.36MHz	1, 2, 4, 5	-Infinity	-65.38		
	dBm/38.16MH z	3, 6	-Infinity	-61.06		
Propagation Condition		1, 2, 3, 4, 5, 6	ET	J70		
Antenna Configuration and Correlation Matrix		1, 2, 3, 4, 5, 6	1x2	Low		
Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted nower spectral						

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

Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

# A.8.4.2.4.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 1280 ms from the beginning of time period T2. The UE shall not send event triggered

measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 12160 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 1280 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than 12160 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In tests 1, 2, 3 and 4, the UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.8.4.2.5 NR Inter-RAT event triggered reporting tests for FR2 without SSB time index detection when DRX is not used

### A.8.4.2.5.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause 8.1.2.4.21 of TS 36.133 [15] for E-UTRAN FDD-NR measurements and clause 8.1.2.4.22 of TS 36.133 [15] for E-UTRAN TDD-NR measurements.

In this test, there are two cells: E-UTRA cell 1 as PCell on E-UTRA RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 1. The test parameters are given in Tables A.8.4.2.5.1-1, A.8.4.2.5.1-2 and A.8.4.2.5.1-3.

The cell specific test parameters for E-UTRA cell1 as PCell are defined in clause A.3.7.2.2.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.8.4.2.5.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table A.8.4.2.5.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B1 (Inter RAT neighbour becomes better than threshold) [16] is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have timing information of NR cell 2

Table A.8.4.2.5.1-1: NR inter-RAT event triggered reporting tests without SSB index reading for FR2 in non-DRX

Configuration	Description
1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note 1: The UE is only re	equired to be tested in one of the supported test configurations.

Table A.8.4.2.5.1-2: General test parameters for NR inter-RAT event triggered reporting for FR2 without SSB time index detection in non-DRX

Parameter	Unit	Test	Value		Comment	
		configurati on	Test 1	Test 2		
RF Channel Numbers		1, 2		2	One LTE and one FR2 NR carrier	
					frequencies are used.	
Active cell		1, 2	E-UTRA cell	1 (PCell)	E-UTRA cell 1 is on E-UTRA RF channel	
					number 1 as defined in clause A.3.7.2.2.	
Neighbour cell		1, 2	NR cell 2		NR cell 2 is on NR RF channel number 1.	
Gap Pattern Id		1, 2	0	4	As specified in clause Table 8.1.2.1-1 of	
					TS 36.133 [15].	
Measurement gap		1, 2	39	19	As specified in TS 36.331 [16].	
offset						
b1-ThresholdNR	dBm	1, 2	Note 1		SS-RSRP threshold for SS-RSRP	
					measurement on cell 2 for event B1 [16]	
Hysteresis	dB	1, 2	0			
CP length		1, 2	Normal			
TimeToTrigger	S	1, 2	0			
Filter coefficient		1, 2	0		L3 filtering is not used	
DRX		1, 2	OFF		DRX is not used	
Time offset between		1	3ms		Asynchronous cells.	
serving and neighbour					The timing of Cell 2 is 3ms later than the	
cells					timing of Cell 1.	
		2	3μs		Synchronous cells.	
T1	S	1, 2	10			
T2	S	1, 2	6	3		
Note 1: The value of b						

Table A.8.4.2.5.1-3: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR2 without SSB time index detection in non-DRX

Parameter	Unit	Test	Co	ell 2	
		configuration	T1	T2	
NR RF Channel Number		1, 2		1	
Duplex mode		1, 2	•	DD	
TDD configuration		1, 2		Conf.3.1	
BW <sub>channel</sub>	MHz	1, 2	100: N	$_{RB,c} = 66$	
OCNG patterns defined in A.3.2.1.1 (OP.1)		1, 2	0	P.1	
SMTC configuration defined in A.3.11.1		1	SM	TC.2	
and A.3.11.2		2	SM	TC.1	
PDSCH/PDCCH subcarrier spacing	kHz	1, 2	1	20	
b1-ThresholdNR UE power class 3	dBm/SCS	1, 2	′	108	
EPRE ratio of PSS to SSS		1, 2			
EPRE ratio of PBCH DMRS to SSS					
EPRE ratio of PBCH to PBCH DMRS					
EPRE ratio of PDCCH DMRS to SSS					
EPRE ratio of PDCCH to PDCCH DMRS					
EPRE ratio of PDSCH DMRS to SSS				0	
EPRE ratio of PDSCH to PDSCH					
EPRE ratio of OCNG DMRS to SSS (Note					
1)					
EPRE ratio of OCNG to OCNG DMRS					
(Note 1)					
AoA setup defined in A.3.15.2.1	15 (45)	1, 2		up 2a	
$N_{oc}^{Note2}$	dBm/15kHz	1, 2	-	l11	
$N_{oc}^{ m Note2}$	dBm/SCS	1, 2	′	102	
SS-RSRP Note 3	dBm/SCS	1, 2	-Infinity	-88	
$\hat{E}_{s}/I_{ot}$	dB	1, 2	-Infinity	14	
$\hat{E}_s/N_{oc}$	dB	1, 2	-Infinity	14	
Io <sup>Note3</sup>	dBm/95.04MH	1, 2	-Infinity	-58.84	
Draw a wation Condition	Z	4.0	A 1 /	VON	
Propagation Condition	Propagation Condition 1, 2 AWGN				

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

Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

# A.8.4.2.5.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event B1 triggered measurement report, with a measurement reporting delay less than D1 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event B1 triggered measurement report, with a measurement reporting delay less than D2 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and test 2, the UE is not required to report SSB time index.

Table A.8.4.2.5.2-1: Test requirements for NR inter-RAT event triggered reporting for FR2 without SSB time index detection in non-DRX

Test case	Measurement reporting delay (ms)				
	Test 1: D1 ms Test 2: D2 ms				
UE power class 3	3200	1600			

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.8.4.2.6 NR Inter-RAT event triggered reporting tests for FR2 without SSB time index detection when DRX is used

#### A.8.4.2.6.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause 8.1.2.4.21 of TS 36.133 [15] for E-UTRAN FDD-NR measurements and clause 8.1.2.4.22 of TS 36.133 [15] for E-UTRAN TDD-NR measurements.

In this test, there are two cells: E-UTRA cell 1 as PCell on E-UTRA RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 1. The test parameters are given in Tables A.8.4.2.6.1-1, A.8.4.2.6.1-2 and A.8.4.2.6.1-3.

The cell specific test parameters for E-UTRA cell1 as PCell are defined in clause A.3.7.2.2.

In tests 1 and 2, measurement gap pattern configuration # 0 as defined in Table A.8.4.2.6.1-2 is provided for UE that does not support per-FR gap and in tests 3 and 4, measurement gap pattern configuration #4 as defined in Table A.8.4.2.6.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B1 (Inter RAT neighbour becomes better than threshold) [16] is used. In the measurement configuration the UE shall be indicated to report the SSB index of the identified NR cell. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have timing information of NR cell 2.

Table A.8.4.2.6.1-1: NR inter-RAT event triggered reporting tests without SSB index reading for FR2 in DRX

Configuration Description				
1		LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode		
2		LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode		
Note 1:	The UE is only required to be tested in one of the supported test configurations.			

Table A.8.4.2.6.1-2: General test parameters for NR inter-RAT event triggered reporting for FR2 without SSB time index detection in DRX

Parameter	Unit	Test	Value				Comment
		configuratio	Test	Test 2	Test	Test 4	
		n	1		3		
RF Channel		1, 2		2	2		One LTE and 1 FR2 NR carrier
Number		4 0 0 4 5	E LITO	A == II 4 /DC	2-11)		frequencies are used.
Active cell		1, 2, 3, 4, 5, 6	E-UIR/	A cell 1 (PC	Je∥)		E-UTRA cell 1 is on E-UTRA RF channel number 1 as defined in
		0					clause A.3.7.2.2.
Neighbour cell		1, 2, 3, 4, 5,	NR cell	2			NR cell 2 is on NR RF channel number
14olgribour con		6	1111 0011	_			1.
Gap Pattern Id		1, 2, 3, 4, 5,	0		4		As specified in clause Table 8.1.2.1-1
		6					of TS 36.133 [15].
Measurement gap		1, 2, 3, 4, 5,	39		19		As specified in TS 36.331 [16].
offset		6					
b1-ThresholdNR	dB	1, 2	Note 1				SS-RSRP threshold for SS-RSRP
	m						measurement on cell 2 for event B1 [16]
Hysteresis	dB	1, 2, 3, 4, 5,	0				[10]
11/01010010	42	6					
CP length		1, 2, 3, 4, 5,	Normal				
		6					
TimeToTrigger	S	1, 2, 3, 4, 5, 6	0				
Filter coefficient		1, 2, 3, 4, 5,	0				L3 filtering is not used
1 iitor oooiiiolont		6					Lo moning is not assu
DRX		1, 2, 3, 4, 5,	DRX.	DRX.10	DRX.	DRX.10	As specified in clause A.3.3
		6	9		9		
Time offset		1	3ms				Asynchronous cells.
between serving							The timing of Cell 2 is 3ms later than
and neighbour cells		0					the timing of Cell 1.
		2	3μs 5				Synchronous cells.
T1	S	1, 2, 3, 4, 5, 6	3				
T2	s	1, 2, 3, 4, 5,	6	83	6	83	
12		6			~		
Note 1: The value	e of b1-	ThresholdNR is	defined i	n Table A.8	3.4.2.5.1	-3	

Table A.8.4.2.6.1-3: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR2 without SSB time index detection in DRX

Parameter	Unit	Test	Ce	ell 2
		configuration	T1	T2
NR RF Channel Number		1, 2		1
Duplex mode		1, 2	TDD	
TDD configuration		1, 2		conf.3.1
BWchannel	MHz	1, 2	100: N	<sub>RB,c</sub> = 66
OCNG patterns defined in A.3.2.1.1 (OP.1)		1, 2	0	P.1
SMTC configuration defined in A.3.11.1		1	SM	TC.2
and A.3.11.2		2	SM	TC.1
PDSCH/PDCCH subcarrier spacing	kHz	1, 2	1	20
b1-ThresholdNR UE power class 3	dBm/SCS	1, 2	-	96
EPRE ratio of PSS to SSS		1, 2		
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				0
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS (Note				
1)				
EPRE ratio of OCNG to OCNG DMRS				
(Note 1)				
AoA setup defined in A.3.15.1		1, 2		tup 1
$N_{oc}^{ m Note2}$	dBm/15kHz	1, 2	-1	111
$N_{oc}^{ m Note2}$	dBm/SCS	1, 2	-1	02
SS-RSRP Note 3	dBm/SCS	1, 2	-Infinity	-88
$\hat{E}_s/I_{ot}$	dB	1, 2	-Infinity	14
$\hat{E}_s/N_{oc}$	dB	1, 2	-Infinity	14
Io <sup>Note3</sup>	dBm/95.04MH	1, 2	-Infinity	-58.84
	Z			
Propagation Condition	!! :- £ . !! !!	1, 2	AV	VGN

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

Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

#### A.8.4.2.6.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event B1 triggered measurement report, with a measurement reporting delay less than D1 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-UE gap, the UE shall send one Event B1 triggered measurement report, with a measurement reporting delay less than D2 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-FR gap, the UE shall send one Event B1 triggered measurement report, with a measurement reporting delay less than D3 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event B1 triggered measurement report, with a measurement reporting delay less than D4 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In tests 1, 2, 3 and 4, the UE is not required to report SSB time index.

Table A.8.4.2.6.2-1: Test requirements for NR inter-RAT event triggered reporting for FR2 without SSB time index detection in DRX

Test case	Measurement reporting delay (ms)						
	Test 1: D1 ms Test 2: D2 ms Test 3: D3 ms Test 4: D4 ms						
UE power class 3	4800	51200	4800	51200			

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.8.4.2.7 NR Inter-RAT event triggered reporting tests for FR2 with SSB time index detection when DRX is not used

#### A.8.4.2.7.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause 8.1.2.4.21 of TS 36.133 [15] for E-UTRAN FDD-NR measurements and clause 8.1.2.4.22 of TS 36.133 [15] for E-UTRAN TDD-NR measurements.

In this test, there are two cells: E-UTRA cell 1 as PCell on E-UTRA RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 1. The test parameters are given in Tables A.8.4.2.7.1-1, A.8.4.2.7.1-2 and A.8.4.2.7.1-3.

The cell specific test parameters for E-UTRA cell1 as PCell are defined in clause A.3.7.2.2.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.8.4.2.7.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table A.8.4.2.7.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B1 (Inter RAT neighbour becomes better than threshold) [16] is used. In the measurement configuration the UE shall be indicated to report the SSB index of the identified NR cell. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

Table A.8.4.2.7.1-1: NR inter-RAT event triggered reporting tests with SSB index reading for FR2 in non-DRX

Cor	nfiguration	Description		
1		LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode		
2		LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode		
Note 1:	The UE is only required to be tested in one of the supported test configurations.			

Table A.8.4.2.7.1-2: General test parameters for NR inter-RAT event triggered reporting for FR2 with SSB time index detection in non-DRX

Parameter	Unit	Test	Va	lue	Comment
		configurati on	Test 1	Test 2	
RF Channel Numbers		1, 2		2	One LTE and one FR2 NR carrier frequencies are used.
Active cell		1, 2	E-UTRA cell	1 (PCell)	E-UTRA cell 1 is on E-UTRA RF channel number 1 as defined in clause A.3.7.2.2.
Neighbour cell		1, 2	NR cell 2		NR cell 2 is on NR RF channel number 1.
Gap Pattern Id		1, 2	0	4	As specified in clause Table 8.1.2.1-1 of TS 36.133 [15].
Measurement gap offset		1, 2	39	19	As specified in TS 36.331 [16].
b1-ThresholdNR	dBm	1, 2	Note 1		SS-RSRP threshold for SS-RSRP measurement on cell 2 for event B1 [16]
Hysteresis	dB	1, 2	0		
CP length		1, 2	Normal		
TimeToTrigger	S	1, 2	0		
Filter coefficient		1, 2	0		L3 filtering is not used
DRX		1, 2	OFF		DRX is not used
Time offset between serving and neighbour cells		1	3ms		Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		2	3μs		Synchronous cells.
T1	S	1, 2	5		
T2	S	1, 2	5	3	
Note 1: The value of b	1-Thres	holdNR is defin	ed in Table A.	8.4.2.5.1-3	

Table A.8.4.2.7.1-3: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR2 with SSB time index detection in non-DRX

Parameter	Unit	Test	Ce	ell 2
		configuration	T1	T2
NR RF Channel Number		1, 2		1
Duplex mode		1, 2	TDD	
TDD configuration		1, 2		conf.3.1
BWchannel	MHz	1, 2	100: N	<sub>RB,c</sub> = 66
OCNG patterns defined in A.3.2.1.1 (OP.1)		1, 2	0	P.1
SMTC configuration defined in A.3.11.1		1	SM	TC.2
and A.3.11.2		2	SM	TC.1
PDSCH/PDCCH subcarrier spacing	kHz	1, 2	1	20
b1-ThresholdNR UE power class 3	dBm/SCS	1, 2	-	96
EPRE ratio of PSS to SSS		1, 2		
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				0
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS (Note				
1)				
EPRE ratio of OCNG to OCNG DMRS				
(Note 1)				
AoA setup defined in A.3.15.1		1, 2		tup 1
$N_{oc}^{ m Note2}$	dBm/15kHz	1, 2	-1	111
$N_{oc}^{ m Note2}$	dBm/SCS	1, 2	-1	02
SS-RSRP Note 3	dBm/SCS	1, 2	-Infinity	-88
$\hat{E}_s/I_{ot}$	dB	1, 2	-Infinity	14
$\hat{E}_s/N_{oc}$	dB	1, 2	-Infinity	14
Io <sup>Note3</sup>	dBm/95.04MH	1, 2	-Infinity	-58.84
	Z			
Propagation Condition	!! :- £ . !! !!	1, 2	AV	VGN

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

Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

# A.8.4.2.7.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than D1 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than D2 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and test 2, the UE is required to report SSB time index.

NOTE: The actual overall delays measured in the test may be up to 2xTTI<sub>DCCH</sub> higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

Table A.8.4.2.7.2-1: Test requirements for NR inter-RAT event triggered reporting for FR2 with SSB time index detection in non-DRX

Test case	Measurement reporting delay (ms)				
	Test 1: D1 ms Test 2: D2 ms				
UE power class 3	4160	2080			

# A.8.4.2.8 NR Inter-RAT event triggered reporting tests for FR2 with SSB time index detection when DRX is used

# A.8.4.2.8.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the NR inter-RAT cell search requirements in clause 8.1.2.4.21 of TS 36.133 [15] for E-UTRAN FDD-NR measurements and clause 8.1.2.4.22 of TS 36.133 [15] for E-UTRAN TDD-NR measurements.

In this test, there are two cells: E-UTRA cell 1 as PCell on E-UTRA RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 1. The test parameters are given in Tables A.8.4.2.8.1-1, A.8.4.2.8.1-2 and A.8.4.2.8.1-3.

The cell specific test parameters for E-UTRA cell1 as PCell are defined in clause A.3.7.2.2.

In tests 1 and 2, measurement gap pattern configuration # 0 as defined in Table A.8.4.2.8.1-2 is provided for UE that does not support per-FR gap and in tests 3 and 4, measurement gap pattern configuration #4 as defined in Table A.8.4.2.8.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event B1 (Inter RAT neighbour becomes better than threshold) [16] is used. In the measurement configuration the UE shall be indicated to report the SSB index of the identified NR cell. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

Table A.8.4.2.8.1-1: NR inter-RAT event triggered reporting tests with SSB index reading for FR2 in DRX

Configurat	ion	Description
1		LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2		LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note 1: The U	E is only red	quired to be tested in one of the supported test configurations.

Table A.8.4.2.8.1-2: General test parameters for NR inter-RAT event triggered reporting for FR2 with SSB time index detection in DRX

Parameter	Unit	Test	Value			Comment	
		configuratio	Test	Test 2	Test	Test 4	
		n	1		3		
RF Channel		1, 2		2	2		One LTE and 1 FR2 NR carrier
Number						frequencies are used.	
Active cell		1, 2	E-UTR	A cell 1 (PC	Cell)		E-UTRA cell 1 is on E-UTRA RF channel
							number 1 as defined in clause A.3.7.2.2.
Neighbour cell		1, 2	NR cell	2			NR cell 2 is on NR RF channel number 1.
Gap Pattern Id		1, 2	0		4		As specified in clause Table 8.1.2.1-1 of
							TS 36.133 [15].
Measurement		1, 2	39		19		As specified in TS 36.331 [16].
gap offset							
b1-ThresholdNR	dBm	1, 2	Note 1				SS-RSRP threshold for SS-RSRP
							measurement on cell 2 for event B1 [16]
Hysteresis	dB	1, 2	0				
CP length		1, 2	Normal				
TimeToTrigger	S	1, 2	0				
Filter coefficient		1, 2	0				L3 filtering is not used
DRX			DRX.	DRX.10	DRX.	DRX.10	As specified in clause A.3.3
			9		9		
Time offset		1	3ms				Asynchronous cells.
between serving							The timing of Cell 2 is 3ms later than the
and neighbour							timing of Cell 1.
cells		2	3μs				Synchronous cells.
T1	s	1, 2	5				
T2	S	1, 2	7	70	7	70	
Note 1: The value of b1-ThresholdNR is defined in Table A.8.4.2.5.1-3							

Table A.8.4.2.8.1-3: NR neighbour cell specific test parameters for NR inter-RAT event triggered reporting for FR2 with SSB time index detection

Parameter	Unit	Test	Cell 2	
		configuration	T1	T2
NR RF Channel Number		1, 2	1	
Duplex mode		1, 2	TDD	
TDD configuration		1, 2	TDDC	onf.3.1
BW <sub>channel</sub>	MHz	1, 2	100: N <sub>RB,c</sub> = 66	
OCNG patterns defined in A.3.2.1.1 (OP.1)		1, 2	0	P.1
SMTC configuration defined in A.3.11.1		1	SM	TC.2
and A.3.11.2		2	SM	TC.1
PDSCH/PDCCH subcarrier spacing	kHz	1, 2	1	20
b1-ThresholdNR UE power class 3	dBm/SCS	1, 2	-	96
EPRE ratio of PSS to SSS		1, 2		
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				0
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS (Note				
1)				
EPRE ratio of OCNG to OCNG DMRS				
(Note 1)				
AoA setup defined in A.3.15.1		1, 2		up 1
$N_{oc}^{\text{Note2}}$	dBm/15kHz	1, 2	_^	111
$N_{oc}$ Note2	dBm/SCS	1, 2		02
SS-RSRP Note 3	dBm/SCS	1, 2	-Infinity	-88
$\hat{E}_{s}/I_{ot}$	dB	1, 2	-Infinity	14
$\hat{E}_s/N_{oc}$	dB	1, 2	-Infinity	14
Io <sup>Note3</sup>	dBm/95.04MH	1, 2	-Infinity	-58.84
	Z			
Propagation Condition		1, 2	AV	VGN

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

Note 3: SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

# A.8.4.2.8.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than D1 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-UE gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than D2 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than D3 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event B2 triggered measurement report, with a measurement reporting delay less than D4 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In tests 1, 2, 3 and 4, the UE is required to report SSB time index.

Table A.8.4.2.8.2-1: Test requirements for NR inter-RAT event triggered reporting for FR2 with SSB time index detection in DRX

Test case		Measurement reporting delay (ms)			
	Test 1: D1 ms	Test 2: D2 ms	Test 3: D3 ms	Test 4: D4 ms	
UE power class 3	6240	66560	6240	66560	

NOTE: The actual overall delays measured in the test may be up to  $2xTTI_{DCCH}$  higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

# A.8.5 Measurement performance

# A.8.5.1 SFTD accuracy

# A.8.5.1.1 SFTD accuracy

### A.8.5.1.1.1 Test Purpose

The purpose of this set of tests is to verify that the SFTD measurement accuracy is within the specified limits. This test will verify the requirements as specified in clause 9.1.27 in TS 36.133 [15] for inter-RAT FR1 SFTD measurements.

#### A.8.5.1.1.2 Test Environment

Supported test configurations are shown in Table A.8.5.1.1.2-1. In this set of test cases there are two cells on different carriers. Cell 1 is E-UTRAN PCell and Cell 2 is inter-RAT NR FR1 target cell. The test parameters of cell 1 are given in clause A.8.5.1.1.2-2. The test parameters of cell 2 are given in Table A.8.5.1.1.2-3. The SFTD between PCell and target cell shall be set by the test equipment to one of the time differences in Table A.8.5.1.1.2-4.

Table A.8.5.1.1.2-1: Supported test configurations for SFTD accuracy

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

Table A.8.5.1.1.2-2: Test parameters for SFTD accuracy (Cell 1)

Parameter	Unit	Test 1
E-UTRA RF Channel Number		1
Duplex mode		FDD or TDD

TDD special subframe configuration <sup>Note1</sup>		6
TDD uplink-downlink configuration <sup>Note1</sup>		1
BW <sub>channel</sub>		5 MHz: N <sub>RB,c</sub> = 25
		10 MHz: N <sub>RB,c</sub> = 50
		20 MHz: N <sub>RB,c</sub> = 100
PDSCH parameters:		5 MHz: R.7 FDD
DL Reference Measurement Channel <sup>Note2</sup>		10 MHz: R.3 FDD
		20 MHz: R.6 FDD
		5 MHz: R.4 TDD
		10 MHz: R.0 TDD
		20 MHz: R.3 TDD
PCFICH/PDCCH/PHICH parameters:		5 MHz: R.11 FDD
DL Reference Measurement Channel <sup>Note2</sup>		10 MHz: R.6 FDD
		20 MHz: R.10 FDD
		5 MHz: R.11 TDD
		10 MHz: R.6 TDD
		20 MHz: R.10 TDD
OCNG Patterns <sup>Note2</sup>		5 MHz: OP.20 FDD
		10 MHz: OP.10 FDD
		20 MHz: OP.17 FDD
		5 MHz: OP.9 TDD
		10 MHz: OP.1 TDD
		20 MHz: OP.7 TDD
PBCH RA	dB	
PBCH RB	dB	
PSS RA	dB	
SSS_RA	dB	
PCFICH RB	dB	
PHICH RA	dB	
PHICH RB	dB	0
PDCCH RA	dB	
PDCCH RB	dB	
PDSCH RA	dB	
PDSCH RB	dB	
OCNG RA <sup>Note3</sup>	dB	
OCNG_RANGES OCNG_RBNote3	dB dB	
NocNote4	dBm/15 kHz	104
Ês/Noc		-104
	dB	-3
RSRP Note5	dB dBm/45 kHz	-3 -107
SCH RP Note5	dBm/15 kHz	
IO Note5	dBm/15 kHz	-107
10 1000	dBm/Ch BW	-74.45
		+10log
D 0 FC		(N <sub>RB,c</sub> /50)
Propagation Condition		AWGN
Antenna Configuration		1x2

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211 [23].

Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 [15] respectively.

Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.

Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.

Note 5: Es/lot, RSRP, SCH\_RP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Table A.8.5.1.1.2-3: Test parameters for SFTD accuracy (Cell 2)

	Parameter	Config	Unit	Test 1	
SSB GSCN	l .	1~6		freq1	
		1,4		FDD	
Duplex mo	Duplex mode			TDD	
'		2,5 3,6		TDD	
		1,4		N/A	
TDD Config	guration	2,5		TDDConf.1.1	
	ga. a	3,6		TDDConf.2.1	
				10: N <sub>RB,c</sub> = 52	
BW <sub>channel</sub>		1,4 2,5	MHz	10: N <sub>RB,c</sub> = 52	
DVVchamie		3,6	_	40: N <sub>RB,c</sub> = 106	
		1,4		SR.1.1 FDD	
PDSCH Re	eference measurement	2,5		SR.1.1 TDD	
channel		3,6		SR.2.1 TDD	
DMCLCOD	CCCT Defended Charmal	1,4		CR.1.1 FDD	
KIVISI COR	RESET Reference Channel	2,5		CR.1.1 TDD	
		3,6		CR.2.1 TDD	
5140 005	505T D (	1,4		CCR.1.1 FDD	
RMC COR	ESET Reference Channel	2,5		CCR.1.1 TDD	
		3,6		CCR.2.1 TDD	
		1,4		SSB.1 FR1	
SSB config	uration	2,5		SSB.1 FR1	
		3,6		SSB.2 FR1	
SMTC con		1~6		SMTC.1	
DL BWP co	onfiguration	1~6		DLBWP.1.1	
UL BWP co	onfiguration	1~6		ULBWP.1.1	
OCNG Pat	terns	1~6		OP.1	
EPRE ratio	of PSS to SSS				
EPRE ratio	of PBCH DMRS to SSS				
EPRE ratio	of PBCH to PBCH DMRS				
	of PDCCH DMRS to SSS				
EPRE ratio	of PDCCH to PDCCH				
DMRS					
EPRE ratio	of PDSCH DMRS to SSS	1~6	dB	0	
	of PDSCH to PDSCH				
DMRS		-			
EPRE ratio	of OCNG DMRS to SSS <sup>Note</sup>				
1					
EPRE ratio	of OCNG to OCNG DMRS				
Note 1					
	NR FDD FR1 A,				
	NR_TDD_FR1_A NOTE 5				
	NR FDD FR1 B				
	NR TDD FR1 C				
Note?	NR FDD FR1 D,				
$N_{oc}^{ m Note2}$	NR_TDD_FR1_D	1~6	dBm/15kHz	-104	
	NR FDD FR1 E,				
	NR TDD FR1 E				
	NR FDD FR1 G				
	NR FDD FR1 H				
	NR FDD FR1 A,				
	NR_TDD_FR1_A NOTE 5				
	NR FDD FR1 B				
	NR TDD FR1 C	4	dBm/SSB SCS		
$N_{oc}$ Note2		1,2,4,5	4DIII/33D 3C3	-104	
	NR_FDD_FR1_D,				
	NR_TDD_FR1_D				
	NR_FDD_FR1_E,				
	NR_TDD_FR1_E				

	ND 500 504 0	T	1	
	NR_FDD_FR1_G			
	NR_FDD_FR1_H		_	
	NR_FDD_FR1_A,			
	NR_TDD_FR1_A NOTE 5			
	NR_FDD_FR1_B			
	NR_TDD_FR1_C			
	NR_FDD_FR1_D,	3,6		-101
	NR_TDD_FR1_D	0,0		101
	NR_FDD_FR1_E,			
	NR_TDD_FR1_E			
	NR_FDD_FR1_G			
	NR_FDD_FR1_H			
$\hat{E}_{s}/I_{ot}$		1~6	dB	-3
$\hat{E}_s/N_{oc}$		1~6	dB	-3
$L_s/V_{oc}$	ND EDD ED4 A	11-0	QD	-3
	NR_FDD_FR1_A,			
	NR_TDD_FR1_A NOTE 5	_		
	NR_FDD_FR1_B	4		
	NR_TDD_FR1_C	_		
	NR_FDD_FR1_D,	1,2,4,5		-107
	NR_TDD_FR1_D			.01
	NR_FDD_FR1_E,		- dBm/SCS	
	NR_TDD_FR1_E			
	NR_FDD_FR1_G			
SS-RSRP	NR_FDD_FR1_H			
Note3	NR_FDD_FR1_A,			
	NR_TDD_FR1_A <sup>NOTE 5</sup>			
	NR_FDD_FR1_B			-104
	NR_TDD_FR1_C			
	NR FDD FR1 D,			
	NR TDD FR1 D	3,6		
	NR_FDD_FR1_E,			
	NR TDD FR1 E			
	NR FDD FR1 G			
	NR FDD FR1 H			
	NR FDD FR1 A,			
	NR_TDD_FR1_A NOTE 5			
	NR FDD FR1 B			
	NR TDD FR1 C	1		
	NR FDD FR1 D,	†		
	NR TDD FR1 D	1,2,4,5	dBm/9.36 MHz	-74.28
	NR_FDD_FR1_E,	1		
	NR TDD FR1 E			
	NR FDD FR1 G	1		
	NR FDD FR1 H	1		
lo Note3	NR FDD FR1 A,			
	NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5			
		-		
	NR_FDD_FR1_B	4		
	NR_TDD_FR1_C	4	dD:==/20.40	
	NR_FDD_FR1_D,	3,6	dBm/38.16	-68.18
	NR_TDD_FR1_D	<u>,</u>	MHz	
	NR_FDD_FR1_E,			
	NR_TDD_FR1_E			
	NR_FDD_FR1_G			
	NR_FDD_FR1_H			
Propagation		1~6		AWGN
Antenna co	ntiguration	1~6		1x2

Note 1:	OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3:	SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4:	SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
Note 5:	The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

Table A.8.5.1.1.2-4: Timing offsets for SFTD accuracy test

Configuration	SFN offset between PCell	Frame boundary offset between PCell and
	and PSCell	PSCell (Ts)
1	100	-122000
2	300	-60540
3	500	1000
4	700	62540
5	900	124000

# A.8.5.1.1.3 Test Requirements

The SFTD reported by the UE consists of 2 elements, SFN offset and frame boundary offset between PCell and inter-RAT NR target cell. The reported SFTD accuracy shall fulfil the requirement in clause 9.1.27 in TS 36.133 [15].

# A.8.5.2 E-UTRA – NR Inter-RAT Measurement Performance requirements

#### A.8.5.2.1 SS-RSRP

#### A.8.5.2.1.1 E-UTRAN – NR inter-RAT measurements with FR1 target cell

#### A.8.5.2.1.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clause 9.11.1 in TS 36.133 [15] for inter-RAT FR1 SS-RSRP measurements.

### A.8.5.2.1.1.2 Test Parameters

Supported test configurations are shown in Table A.8.5.2.1.1.2-1. In this test case there are two cells on different carriers. Cell 1 is the E-UTRA cell which specific test parameters for this test case are specified in Table A.3.7.2.1-1. Cell 2 is the inter-RAT NR FR1 target cell. The absolute accuracy requirements of SS-RSRP inter-RAT measurement is tested by using test parameters in Table A.8.5.2.1.1.2-2.

Table A.8.5.2.1.1.2-1: SS-RSRP Inter-RAT SS-RSRP supported test configurations

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

Table A.8.5.2.1.1.2-2: SS-RSRP inter-RAT test parameters

Parameter		Unit		st 1		st 2
SSB ARFCN	SSB ARFCN					eq1
	Config 1,4		FDD			· <del>· · · · · · · · · · · · · · · · · · </del>
Duplex mode	Config 2,3,5,6		TDD			
	Config 1,4			Not Ap	plicable	
TDD configuration	Config 2,5			TDDC	onf.1.1	
	Config 3,6			TDDC	onf.2.1	
Downlink initial BWP cor	figuration			DLB\	VP.0.1	
Downlink dedicated BWI	configuration			DLB\	VP.1.1	
Uplink initial BWP config	uration			ULBV	VP.0.1	
Uplink dedicated BWP c	onfiguration			ULB\	VP.1.1	
DRX Cycle configuration		ms		Not Ap	plicable	
	Config 1,4			TRS.1	.1 FDD	
TRS configuration	Config 2,5			TRS.1	.1 TDD	
	Config 3,6			TRS.1	.2 TDD	
	Config 1,4					
PDSCH Reference measurement channel	Config 2,5			-		-
	Config 3,6					
	Config 1,4					
RMSI CORESET Reference Channel	Config 2,5			-		-
	Config 3,6					
	Config 1,4					
Dedicated CORESET Reference Channel	Config 2,5			-		-
	Config 3,6					
OCNG Patterns				0	P.1	
SS-RSSI-Measurement				Not Applicable		
SMTC configruation				SMTC.1		
00D	Config 1,2,4,5			SSB	1 FR1	
SSB configuration	Config 3,6			SSB	2 FR1	
PDSCH/PDCCH	Config 1,2,4,5		15			
subcarrier spacing	Config 3,6	– kHz	30			
EPRE ratio of PSS to SSS	1					
EPRE ratio of PBCH DMRS						
EPRE ratio of PBCH to PBCEPRE ratio of PDCCH DMF		dB	0	0	0	0
EPRE ratio of PDCCH to P		۵۵ ا				J
EPRE ratio of PDSCH DMF		7				
EPRE ratio of PDSCH to PI						

EPRE ratio	of OCNG DMR	S to SSS(Note 1)			
EPRE ratio	of OCNG to OC	NG DMRS (Note 1)			
		NR_FDD_FR1_A NR_TDD_FR1_A NOTE 6			-117
		NR_FDD_FR1_B			-116.5
Note2	Config	NR_TDD_FR1_C	dBm/15k		-116
$N_{oc}^{ m Note2}$	1,2,4,5	NR_FDD_FR1_D NR_TDD_FR1_D	Hz	-94.65	-115.5
		NR_FDD_FR1_E NR_TDD_FR1_E			-115
		NR_FDD_FR1_G NR_FDD_FR1_H			-114 -113.5
					Same as Noc for
	Config 1,2,4	,5		-94.65	15kHz
		NR_FDD_FR1_A NR_TDD_FR1_A NOTE 6			-114
		NR FDD FR1 B			-113.5
$N_{oc}^{$		NR_TDD_FR1_C	dBm/SC		-113
	Config 3,6	NR_FDD_FR1_D NR_TDD_FR1_D	S	-91.65	-112.5
		NR_FDD_FR1_E NR_TDD_FR1_E	-		-112
		NR_FDD_FR1_G			-111
-		NR_FDD_FR1_H	15	40	-110.5
$\hat{E}_s/I_{ot}$			dB	10	-4
$\hat{E}_s/N_{oc}$			dB	10	-4
		NR_FDD_FR1_A NR_TDD_FR1_A NOTE 6			-121
		NR_FDD_FR1_B			-120.5
	Config 1,2,4,5	NR_TDD_FR1_C			-120
		NR_FDD_FR1_D NR_TDD_FR1_D		-84.65	-119.5
		NR_FDD_FR1_E NR_TDD_FR1_E			-119
SS-		NR_FDD_FR1_G NR_FDD_FR1_H	dBm/SC		-118 -117.5
RSRP <sup>Not</sup>		NR FDD FR1 A	S		-117.5
e3		NR_TDD_FR1_A NOTE 6	_		-124
		NR_FDD_FR1_B			-123.5
	0 5 00	NR_TDD_FR1_C		04.05	-123
	Config 3,6	NR_FDD_FR1_D NR_TDD_FR1_D		-81.65	-122.5
		NR_FDD_FR1_E			
		NR TDD FR1 E			-122
		NR_FDD_FR1_G			-121
		NR_FDD_FR1_H			-120.5
		NR_FDD_FR1_A NR_TDD_FR1_A NOTE 6			-87.76
	Comfi	NR_FDD_FR1_B	4D1		-87.26
Io <sup>Note3</sup>	Config 1,2,4,5	NR_TDD_FR1_C	dBm/ 9.36MHz	-56.28	-86.76
	1,4,4,0	NR_FDD_FR1_D NR_TDD_FR1_D	9.00IVII IZ		-86.26
		NR_FDD_FR1_E NR_TDD_FR1_E			-85.76

		NR_FDD_FR1_G			-84.76
		NR_FDD_FR1_H			-84.26
		NR_FDD_FR1_A NR_TDD_FR1_A NOTE 6			-84.76
		NR FDD FR1 B			-84.26
		NR_TDD_FR1_C	dBm/		-83.76
	Config 3,6	NR_FDD_FR1_D NR_TDD_FR1_D	38.16MH z	-50.19	-83.26
		NR_FDD_FR1_E NR_TDD_FR1_E			-82.76
		NR_FDD_FR1_G			-81.76
		NR_FDD_FR1_H			-81.26
Propagation	on condition		-	AW	/GN
Antenna c	configuration		-		x2
Note 1:		e used such that both			
Note 2:	transmitted power spectral density is achieved for all OFDM symbols. Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{\rm ac}$ to be fulfilled.				
Note 3:		d lo levels have been			or information
purposes. They are not settable parameters themselves.  Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.					
Note 5:	·				
Note 6:					

#### A.8.5.2.1.1.3 Test Requirements

The SS-RSRP measurement accuracy for Cell 2 shall fulfil the requirement in clause 9.11.1 in TS 36.133 [15].

# A.8.5.2.1.2 E-UTRAN – NR inter-RAT measurements with FR2 target cell

#### A.8.5.2.1.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clause 9.11.1 in TS 36.133 [15] for inter-RAT FR2 SS-RSRP measurements.

# A.8.5.2.1.2.2 Test Parameters

Supported test configurations are shown in Table A.8.5.2.1.2.2-1. In this test case there are two cells on different carriers. Both absolute accuracy and relative accuracy requirements of SS-RSRP inter-RAT measurement are tested by using test setup in Table A.8.5.2.1.2.2-2 and Table A.8.5.2.1.2.2-3. In all test cases, Cell 2 is target cell. Cell 1 is the E-UTRA cell which specific test parameters for this test case are specified in Table A.3.7.2.1-1.

Table A.8.5.2.1.2.2-1: SS-RSRP Inter-RAT SS-RSRP supported test configurations

Configuration	Description
1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode

Table A.8.5.2.1.2.2-2: SS-RSRP Inter-RAT general test parameters

Parameter	Unit	Test 1	Test 2
Parameter	Onit	Cell 2	Cell 2
SSB ARFCN		Freq1	freq1
Duplex mode		TDD	TDD
TDD configuration		TDDConf.3.1	TDDConf.3.1
BW <sub>channel</sub>	MHz	100: N <sub>RB,c</sub> = 66	100: N <sub>RB,c</sub> = 66
Downlink initial BWP configuration		DLBV	VP.0.1
Downlink dedicated BWP configuration		DLBV	VP.1.1
Uplink initial BWP configuration		ULBV	VP.0.1
Uplink dedicated BWP configuration		ULBV	VP.1.1
DRX cycle configuration	ms	Not ap	plicable
TRS configuration		TRS.2	.1 TDD
TCI state			tate.0
AoA setup		Setup 3 defir	ned in A.3.15
PDSCH Reference measurement channel		-	-
RMSI CORESET Reference Channel		-	-
OCNG Patterns		OP.1	OP.1
SMTC configuration		SMTC.1 FR2	SMTC.1 FR2
PDSCH/PDCCH subcarrier spacing	kHz	120	120
EPRE ratio of PSS to SSS			
EPRE ratio of PBCH_DMRS to SSS			
EPRE ratio of PBCH to PBCH_DMRS			
EPRE ratio of PDCCH_DMRS to SSS			
EPRE ratio of PDCCH to PDCCH_DMRS	dB	0	0
EPRE ratio of PDSCH_DMRS to SSS			
EPRE ratio of PDSCH to PDSCH_DMRS			
EPRE ratio of OCNG DMRS to SSSNote 1			
$\hat{E}_s/N_{oc}$	dB	10	N/A

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

Table A.8.5.2.1.2.2-3: SS-RSRP Inter-RAT OTA related test parameters

Parameter		Unit	Test 1	Test 2
		Onit	Cell 2	Cell 2
			Setup 1	Setup 1
Angle of arrival con	figuration	degrees	according to	according to
			A.3.15.1	A.3.15.1
	NR_TDD_FR2_A			N/A
$N_{oc}^{$	NR_TDD_FR2_B			N/A
00	NR_TDD_FR2_F	dBm/15kHz	400	N/A
	NR_TDD_FR2_G	Note4	-100	N/A
	NR_TDD_FR2_T NR_TDD_FR2_Y			N/A
				N/A
	NR TDD FR2 A		-96	N/A
	NR_TDD_FR2_B	Note3	-90	N/A

$N_{oc}^{$	NR_TDD_FR2_F			N/A	
00	NR_TDD_FR2_G			N/A	
	NR_TDD_FR2_T			N/A	
	NR_TDD_FR2_Y			N/A	
	NR_TDD_FR2_A			Note7	
	NR_TDD_FR2_B	D_FR2_F dBm/SCS	Note7		
SS-RSRPNote2	NR_TDD_FR2_F		95	Note7	
	NR_TDD_FR2_G		-00	Note7	
	NR_TDD_FR2_T			Note7	
	NR_TDD_FR2_Y			Note7	
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$		dB	11	N/A	
	NR_TDD_FR2_A			Note8	
	NR_TDD_FR2_B			Note8	
Io <sup>Note2</sup>	NR_TDD_FR2_F	dBm/95.04	Note8	Note8	
	NR_TDD_FR2_G	MHz Note4	-55.4	Note8	
	NR_TDD_FR2_T			Note8	
	NR_TDD_FR2_Y			Note8	

- Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.
- Note 2: SS-RSRP, and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
- Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone
- Note 6: NR operating band groups are as defined in clause 3.5.2.
- Note 7: SS\_RSRP is applied at level the same as the minimum level specified in Table B.2.3-2 for sphereical coverage.
- Note 8: Io is applied at level 10log<sub>10</sub>(792) dB above the minimum level specified in Table B.2.3-2 for sphereical coverage

#### A.8.5.2.1.2.3 Test Requirements

The SS-RSRP measurement accuracy for Cell 2 shall fulfil the requirement in clause 9.11.1 in TS 36.133 [15].

# A.8.5.2.2 SS-RSRQ

#### A.8.5.2.2.1 E-UTRAN – NR inter-RAT measurements with FR1 target cell

#### A.8.5.2.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in clause 9.11.2 in TS 36.133 [15] for inter-RAT FR1 SS-RSRQ measurements.

#### A.8.5.2.2.1.2 Test Parameters

Supported test configurations are shown in Table A.8.5.2.2.1.2-1. In this test case there are two cells on different carriers. Cell 1 is the E-UTRA cell which specific test parameters for this test case are specified in Table A.3.7.2.1-1. Cell 2 is the inter-RAT NR FR1 target cell. The absolute accuracy requirements of SS-RSRP inter-RAT measurement is tested by using test parameters in Table A.8.5.2.2.1.2-2.

Table A.8.5.2.2.1.2-1: SS-RSRQ Inter-RAT SS-RSRQ supported test configurations

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

Table A.8.5.2.2.1.2-2: SS-RSRQ inter-RAT test parameters

Parame	Parameter		Tes Cel			st 2		st 3 ell 2
SSB ARFCN			freq1 freq1 freq1					
	Config 1,4			۹٠.		DD		- 7 -
Duplex mode	Config 2,3,5,6		TDD					
	Config 1,4				Not Ap	plicable		
TDD configuration	Config 2,5				TDDC	onf.1.1		
	Config 3,6				TDDC	onf.2.1		
Downlink initial BWP cor	nfiguration				DLB\	WP.0.1		
Downlink dedicated BWI	onfiguration				DLB\	WP.1.1		
Uplink initial BWP config					ULB\	VP.0.1		
Uplink dedicated BWP c	onfiguration				ULB\	WP.1.1		
DRX Cycle configuration		ms			Not Ar	plicable		
	Config 1,4					.1 FDD		
TRS configuration	Config 2,5	1				.1 TDD		
<u> </u>	Config 3,6					.2 TDD		
	Config 1,4							
PDSCH Reference measurement channel	Config 2,5		-			-		-
	Config 3,6							
	Config 1,4							
RMSI CORESET Reference Channel	Config 2,5		-			-		-
	Config 3,6							
	Config 1,4							
Dedicated CORESET Reference Channel	Config 2,5		-			-		-
	Config 3,6							
OCNG Patterns					0	P.1		
SS-RSSI-Measurement					Not Ap	plicable		
SMTC configruation					SM	TC.1		
CCD configuration	Config 1,2,4,5				SSB	.1 FR1		
SSB configuration	Config 3,6	7			SSB	.2 FR1		
PDSCH/PDCCH Config 1,2,4,5 Subcarrier spacing Config 3,6						15		
		kHz				30		
EPRE ratio of PSS to SSS								
EPRE ratio of PBCH DMRS	S to SSS							
EPRE ratio of PBCH to PBC	CH DMRS							
EPRE ratio of PDCCH DMF		dB	0	0	0	0	0	0
EPRE ratio of PDCCH to PI		-		-				
EPRE ratio of PDSCH DMF EPRE ratio of PDSCH to PI	NSCH	$\dashv$						
EPRE ratio of OCNG DMRS		$\dashv$						
		l l		1				

FPRF ratio	of OCNG to OC	CNG DMRS (Note 1)				
Li INL Iauo	o, coive to oc	NR_FDD_FR1_A		<u> </u>	l l	
		NR_TDD_FR1_A				-116
	Config 1,2,4,5	NR_FDD_FR1_B				-115.5
$N_{oc}^{$		NR_TDD_FR1_C	dBm/15k	00.40	400	-115
$IV_{oc}$		NR_FDD_FR1_D NR_TDD_FR1_D	Hz	-80.18	-106	-114.5
		NR_FDD_FR1_E				-114.5
		NR_TDD_FR1_E				-114
		NR_FDD_FR1_G				-113
		NR_FDD_FR1_H				-112.5
	Config 1,2,4			-80.18	-106	Same as Noc for 15kHz
		NR_FDD_FR1_A NR_TDD_FR1_A				
		NOTE 6				-113
		NR_FDD_FR1_B				-112.5
$N_{oc}^{ m Note2}$		NR_TDD_FR1_C	dBm/SC			-112
	Config 3,6	NR_FDD_FR1_D	S	-83.27	-110	
		NR_TDD_FR1_D NR_FDD_FR1_E				-111.5
		NR_FDD_FR1_E NR_TDD_FR1_E				-111
		NR_FDD_FR1_G				-110
		NR_FDD_FR1_H				-109.5
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$			dB	-1.75	-1.75	-1.75
$\hat{E}_s/N_{oc}$			dB	-1.75	-1.75	-1.75
	Config	NR_FDD_FR1_A NR_TDD_FR1_A NOTE 6				-117.75
		NR_FDD_FR1_B		-81.93	-107.75	-117.25
		NR_TDD_FR1_C NR_FDD_FR1_D				-116.75
	1,2,4,5	NR_FDD_FR1_D NR_TDD_FR1_D			-107.75	-116.25
		NR_FDD_FR1_E				110.20
		NR_TDD_FR1_E				-115.75
SS-		NR_FDD_FR1_G	ID (0.0			-114.75
RSRPNot		NR_FDD_FR1_H NR_FDD_FR1_A	dBm/SC S			-114.25
e3		NR_FDD_FR1_A NR_TDD_FR1_A NOTE 6	3			-114.75
		NR_FDD_FR1_B				-114.75
		NR_TDD_FR1_C				-113.75
	Config 3,6	NR_FDD_FR1_D		-85.02	-111.75	
		NR_TDD_FR1_D				-113.25
		NR_FDD_FR1_E NR TDD FR1 E				-112.75
		NR FDD FR1 G				-112.75
		NR_FDD_FR1_H				-111.25
		NR_FDD_FR1_A NR_TDD_FR1_A NOTE 6				
		NR FDD FR1 B				
		NR TDD FR1 C				
		NR FDD FR1 D	dB	-14.77	-40.59	-14.76
		NR_TDD_FR1_D				
		NR_FDD_FR1_E				
		NR_TDD_FR1_E				
		NR_FDD_FR1_G NR_FDD_FR1_H				
<u> </u>		ואוי הח ועו"ון וואי ד	l		1	L

		NR_FDD_FR1_A NR_TDD_FR1_A NOTE 6				-85.83
		NR_FDD_FR1_B				-85.33
	Config	NR_TDD_FR1_C	dBm/			-84.83
	1,2,4,5	NR_FDD_FR1_D	9.36MHz	-50	-75.83	-84.33
	,_,,,,	NR_TDD_FR1_D				01.00
		NR_FDD_FR1_E				-83.83
		NR_TDD_FR1_E NR_FDD_FR1_G				-82.83
		NR FDD FR1 H				-82.33
Io <sup>Note3</sup>		NR FDD FR1 A				-02.00
		NR_TDD_FR1_A			-76.73	-79.73
		NR FDD FR1 B				-79.23
		NR_TDD_FR1_C	dBm/			-78.73
	Config 3,6	NR_FDD_FR1_D	38.16MH	-50		-78.23
		NR_TDD_FR1_D	Z			-70.25
		NR_FDD_FR1_E				-77.73
		NR_TDD_FR1_E				70.70
		NR_FDD_FR1_G				-76.73
Propagatio	NR_FDD_FR1_H Propagation condition		_		AWGN	-76.53
	onfiguration		<u>-</u>	AWGN 1x2		
Antellia G	Jilliguralion		_	IAZ		

- Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
- Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.
- Note 3: SS-RSRQ, SS-RSRP, and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 4: SS-RSRQ minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 5: NR operating band groups are as defined in clause 3.5.2.
- Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification.

#### A.8.5.2.2.1.3 Test Requirements

The SS-RSRQ measurement accuracy for Cell 2 shall fulfil the requirement in clause 9.11.2 in TS 36.133 [15].

#### A.8.5.2.2.2 E-UTRAN – NR inter-RAT measurements with FR2 target cell

#### A.8.5.2.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in clause 9.11.2 in TS 36.133 [15] for inter-RAT FR2 SS-RSRQ measurements.

#### A.8.5.2.2.2 Test Parameters

Supported test configurations are shown in Table A.8.5.2.2.2.2-1. In this test case there are two cells on different carriers. Both absolute accuracy and relative accuracy requirements of SS-RSRQ inter-RAT measurement are tested by using test setup in Table A.8.5.2.2.2-2 and Table A.8.5.2.2.2-3. In all test cases, Cell 2 is target cell. Cell 1 is the E-UTRA cell which specific test parameters for this test case are specified in Table A.3.7.2.1-1.

Table A.8.5.2.2.2.1: SS-RSRQ Inter-RAT SS-RSRQ supported test configurations

Configuration	Description
1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode

Table A.8.5.2.2.2-2: SS-RSRQ Inter-RAT general test parameters

Parameter	Unit	Test 1	Test 2	
Parameter	Onit	Cell 2	Cell 2	
SSB ARFCN		Freq1	freq1	
Duplex mode		TDD	TDD	
TDD configuration		TDDConf.3.1	TDDConf.3.1	
BW <sub>channel</sub>	MHz	100: N <sub>RB,c</sub> = 66	100: N <sub>RB,c</sub> = 66	
Downlink initial BWP configuration		DLBV	/P.0.1	
Downlink dedicated BWP configuration		DLBV	/P.1.1	
Uplink initial BWP configuration		ULBV	/P.0.1	
Uplink dedicated BWP configuration		ULBV	/P.1.1	
DRX cycle configuration	ms	Not ap	olicable	
TRS configuration		TRS.2	.1 TDD	
TCI state		TCI.State.0		
AoA setup		Setup 3 defir	ned in A.3.15	
PDSCH Reference measurement channel		-	-	
RMSI CORESET Reference Channel		-	-	
OCNG Patterns		OP.1	OP.1	
SMTC configuration		SMTC.1 FR2	SMTC.1 FR2	
PDSCH/PDCCH subcarrier spacing	kHz	120	120	
EPRE ratio of PSS to SSS				
EPRE ratio of PBCH_DMRS to SSS				
EPRE ratio of PBCH to PBCH_DMRS				
EPRE ratio of PDCCH_DMRS to SSS				
EPRE ratio of PDCCH to PDCCH_DMRS	dB	0	0	
EPRE ratio of PDSCH_DMRS to SSS				
EPRE ratio of PDSCH to PDSCH_DMRS				
EPRE ratio of OCNG DMRS to SSS <sup>Note 1</sup>				
$\hat{E_s}/N_{oc}$	dB	-0.5	-1.75	

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

Table A.8.5.2.2.2.3: SS-RSRQ Inter-RAT OTA related test parameters

Parameter		Unit	Test 1	Test 2
Pa	rameter	Unit	Cell 2	Cell 2
Angle of arrival configuration		degrees	Setup 1 according to A.3.15.1	Setup 1 according to A.3.15.1
	NR_TDD_FR2_A			Note7
Note1	NR_TDD_FR2_B			Note7
$N_{oc}^{$	NR_TDD_FR2_F	R2_G ote4 -105	105	Note7
	NR_TDD_FR2_G		Note7	
	NR_TDD_FR2_T			Note7
	NR_TDD_FR2_Y			Note7
	NR_TDD_FR2_A			Note7
	NR_TDD_FR2_B			Note7
$N_{oc}^{$	NR_TDD_FR2_F	dBm/SCS <sup>Note</sup>	-96	Note7
	NR_TDD_FR2_G		-90	Note7
	NR_TDD_FR2_T			Note7
	NR_TDD_FR2_Y			Note7
	NR_TDD_FR2_A			Note8
	NR_TDD_FR2_B			Note8
SS-RSRP <sup>Note2</sup>	NR_TDD_FR2_F	dBm/SCS	-96.5	Note8
33-K3KF*****	NR_TDD_FR2_G	Note4	-90.5	Note8
	NR_TDD_FR2_T			Note8
	NR_TDD_FR2_Y			Note8
	NR_TDD_FR2_A			-14.82
	NR_TDD_FR2_B			-14.82
SS-RSRQ <sup>Note2</sup>	NR_TDD_FR2_F	dB	-14.4	-14.82
33-K3KQ****	NR_TDD_FR2_G	иь	-14.4	-14.82
	NR_TDD_FR2_T			-14.82
	NR_TDD_FR2_Y			-14.82
${ m \hat{E}}_{ m s}/{ m I}_{ m ot}$		dB	-0.5	-1.75
	NR_TDD_FR2_A			Note 9
	NR_TDD_FR2_B			Note 9
Io <sup>Note2</sup>	NR_TDD_FR2_F	dBm/95.04	5.04 Note 9	
10	NR_TDD_FR2_G	MHz Note4	-03.9	Note 9
	NR_TDD_FR2_T			Note 9
	NR_TDD_FR2_Y			Note 9

- Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.
- Note 2: SS-RSRQ, SS-RSRP, and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 3: SS-RSRQ and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
- Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone
- Note 6: NR operating band groups are as defined in clause 3.5.2.
- Note 7: N<sub>oc</sub> for SCS 15kHz is applied at level -10log<sub>10</sub>(8)+4dB above the minimum level specified in Table B.2.3-2 for sphereical coverage. N<sub>oc</sub> for SCS 120kHz is applied at 4 dB above the minimum level specified in Table B.2.3-2 for sphereical coverage.
- Note 8: SS\_RSRP is applied at level 2.25dB above the minimum level specified in Table B.2.3-2 for sphereical coverage.
- Note 9: Io is applied at level 10log<sub>10</sub>(792)+6.22dB above the minimum level specified in Table B.2.3-2 for sphereical coverage.

#### A.8.5.2.2.3 Test Requirements

The SS-RSRQ measurement accuracy for Cell 2 shall fulfil the requirement in clause 9.11.2 in TS 36.133 [15].

In this test case there are two cells on different carriers and measurement gaps are provided

#### A.8.5.2.3 SS-SINR

#### A.8.5.2.3.1 E-UTRAN – NR inter-RAT measurements with FR1 target cell

#### A.8.5.2.3.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS- SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 9.11.3 in TS 36.133 [15] for inter-RAT FR1 SS-SINR measurements.

#### A.8.5.2.3.1.2 Test Parameters

Supported test configurations are shown in Table A.8.5.2.3.1.2-1. In this test case there are two cells on different carriers. Cell 1 is the E-UTRA cell which specific test parameters for this test case are specified in Table A.3.7.2.1-1. Cell 2 is the inter-RAT NR FR1 target cell. The absolute accuracy requirements of SS-RSRP inter-RAT measurement is tested by using test parameters in Table A.8.5.2.3.1.2-2.

Table A.8.5.2.3.1.2-1: SS- SINR Inter-RAT SS- SINR supported test configurations

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

Table A.8.5.2.3.1.2-2: SS-SINR inter-RAT test parameters

Parameter		Unit	Test 1	Test 2	Test 3	
		Offic	Cell 2	Cell 2	Cell 2	
SSB ARFCN			freq1	freq1	freq1	
Duploy mode	Config 1,4			FDD		
Duplex mode	Config 2,3,5,6			TDD		
	Config 1,4			Not Applicable		
TDD configuration	Config 2,5			TDDConf.1.1		
	Config 3,6		TDDConf.2.1			
Downlink initial BWP cor	nfiguration			DLBWP.0.1		
Downlink dedicated BWI	onfiguration		DLBWP.1.1			
Uplink initial BWP config	uration		ULBWP.0.1			
Uplink dedicated BWP c	onfiguration		ULBWP.1.1			
DRX Cycle configuration	1	ms	Not Applicable			
	Config 1,4		TRS.1.1 FDD			
TRS configuration	Config 2,5		TRS.1.1 TDD			
	Config 3,6		TRS.1.2 TDD			
PDSCH Reference measurement channel	Config 1,4		-	-	-	

			1			1		ı	
		Config 2,5							
		Config 3,6							
		Config 1,4							
RMSI COR Reference		Config 2,5			-		-		-
		Config 3,6							
		Config 1,4							
Dedicated Reference		Config 2,5			-		-		-
		Config 3,6							
OCNG Pat	terns					0	P.1		
SS-RSSI-M	1easurement					Not Ap	plicable		
SMTC conf	SMTC configruation						 TC.1		
	Config 1,2,4,5			SSB.1 FR1					
SSB config	uration	Config 3,6	-		SSB.2 FR1				
DD0011/DE	Config 1 2 4 5			15					
PDSCH/PE subcarrier		Config 3,6	kHz	kHz 30					
		<u> </u>			<u> </u>	· ·	30	ı	
	of PSS to SS of PBCH DM								
		PBCH DMRS	-						
		MRS to SSS							
		PDCCH DMRS	dB	0	0	0	0	0	0
	of PDSCH D	MRS to SSS							
		MRS to SSS <sup>(Note 1)</sup>							
EPRE ratio	of OCNG to	OCNG DMRS (Note 1)							
		NR_FDD_FR1_A NR_TDD_FR1_A NOTE 6						[-1 <sup>-</sup>	19.5]
		NR_FDD_FR1_B	]						19]
$N_{oc}^{ m Note2}$	Config	NR_TDD_FR1_C	dBm/15k		201	F 40	10 E1	[-1	18.5]
1 V oc	1,2,4,5	NR_FDD_FR1_D NR_TDD_FR1_D	Hz	J-6	80]	[-10	8.5]	[-1	18]
		NR_FDD_FR1_E	1					F 44	17 51
		NR_TDD_FR1_E							17.5]
		NR_FDD_FR1_G NR_FDD_FR1_H							16.5]   16]
									s Noc for
	Config 1,2,4			3-]	30]	[-10	8.5]	15	kHz
		NR_FDD_FR1_A NR_TDD_FR1_A NOTE 6	ID (CC					[-1	16.5]
$N_{oc}^{ m Note2}$		NR_FDD_FR1_B	dBm/SC S						16]
	Config 3,6	NR_TDD_FR1_C		[-7	77]	[-10	5.5]	[-1	15.5]
		NR_FDD_FR1_D NR_TDD_FR1_D						[-1	15]
		NR_FDD_FR1_E NR_TDD_FR1_E						[-1	14.5]

		NR FDD FR1 G				[-114.5]		
		NR_FDD_FR1_H				[-113]		
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$			dB	[-1.75]	[20]	[-4.0]		
$\hat{E}_s/N_{oc}$			dB	[-1.75]	[20]	[-4.0]		
		NR_FDD_FR1_A NR_TDD_FR1_A NOTE 6				[-123.5]		
	Config	NR_FDD_FR1_B NR_TDD_FR1_C				[-123] [-122.5]		
	1,2,4,5	NR_FDD_FR1_D NR_TDD_FR1_D		[-81.75]	[-88.5]	[-122]		
		NR_FDD_FR1_E NR_TDD_FR1_E NR_FDD_FR1_G				[-121.5] [-120.5]		
SS-		NR FDD FR1 H	dBm/SC			[-120.5]		
RSRP <sup>Not</sup> e3		NR_FDD_FR1_A NR_TDD_FR1_A NOTE 6	S			[-120.5]		
		NR_FDD_FR1_B NR_TDD_FR1_C				[-120] [-119.5]		
	Config 3,6	NR_FDD_FR1_D NR_TDD_FR1_D		[-78.75]	[-85.5]	[-119]		
		NR_FDD_FR1_E NR_TDD_FR1_E				[-118.5]		
		NR_FDD_FR1_G NR_FDD_FR1_H				[-117.5] [-117]		
	NR_FDD_FR1_ NR_TDD_FR1_ NOTE 6 NR_FDD_FR1							
SS-SINR N	lote3	NR_TDD_FR1_C NR_FDD_FR1_D NR_TDD_FR1_D NR_FDD_FR1_E NR_TDD_FR1_E	dB	dB	dB	[-1.75]	[20]	[-4.0]
		NR_FDD_FR1_G NR_FDD_FR1_H						
		NR_FDD_FR1_A NR_TDD_FR1_A NOTE 6				[-90.09]		
		NR_FDD_FR1_B NR TDD FR1 C			[-60.5]	[-89.59] [-89.09]		
	Config 1,2,4,5	NR_FDD_FR1_D NR_TDD_FR1_D	dBm/ 9.36MHz	[-49.83]		[-88.59]		
		NR_FDD_FR1_E NR_TDD_FR1_E				[-88.09]		
Io <sup>Note3</sup>		NR_FDD_FR1_G NR_FDD_FR1_H				[-87.09] [-86.59]		
		NR_FDD_FR1_A NR_TDD_FR1_A NOTE 6				[-84]		
		NR_FDD_FR1_B NR_TDD_FR1_C	dBm/	_		[-83.5] [-83]		
	Config 3,6	NR_FDD_FR1_D NR_TDD_FR1_D	38.16MH z	[-43.73]	[-54.41]	[-82.5]		
		NR_FDD_FR1_E NR_TDD_FR1_E NR_FDD_FR1_G	-			[-82] [-81]		
		NR_FDD_FR1_H				[-80.5]		

Propagat	tion condition	-	AWGN
Antenna	configuration	-	1x2
Note 1:	OCNG shall be used such that both density is achieved for all OFDM sy		ly allocated and a constant total transmitted power spectral
Note 2:			not specified in the test is assumed to be constant over AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3:	SS-SINR, SS-RSRP, and lo levels hare not settable parameters themse		erived from other parameters for information purposes. They
Note 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent in each receiver antenna port.			e specified assuming independent interference and noise at
Note 5:	NR operating band groups are as de	efined in cla	use 3.5.2.
Note 6:	The test configuration excludes sup release of the specification	port for band	d n51 and it is not required to run this test on band n51 in this

#### A.8.5.2.3.1.3 Test Requirements

The SS-SINR measurement accuracy for Cell 2 shall fulfil the requirement in clause 9.11.3 in TS 36.133 [15].

#### A.8.5.2.3.2 E-UTRAN – NR inter-RAT measurements with FR2 target cell

#### A.8.5.2.3.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS- SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 9.11.3 in TS 36.133 [15] for inter-RAT FR2 SS-SINR measurements.

#### A.8.5.2.3.2.2 Test Parameters

Supported test configurations are shown in Table A.8.5.2.3.2.2-1. In this test case there are two cells on different carriers. Both absolute accuracy and relative accuracy requirements of SS-SINR inter-RAT measurement are tested by using test setup in Table A.8.5.2.3.2.2-2 and A.8.5.2.3.2.2-3. In all test cases, Cell 2 is target cell. Cell 1 is the E-UTRA cell which specific test parameters for this test case are specified in Table A.3.7.2.1-1.

Table A.8.5.2.3.2.2-1: SS-SINR Inter-RAT SS-SINR supported test configurations

Configuration	Description
1	LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
2	LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode

Table A.8.5.2.3.2.2-2: SS-SINR Inter-RAT general test parameters

Davamatav	Unit	Test 1	Test 2	Test 3
Parameter	Unit	Cell 2	Cell 2	Cell 2
SSB ARFCN		Freq1	freq1	freq1
Duplex mode		TDD	TDD	TDD
TDD configuration		TDDConf.3.1	TDDConf.3.1	TDDConf.3.1
BW <sub>channel</sub>	MHz	100: N <sub>RB,c</sub> = 66	100: N <sub>RB,c</sub> = 66	100: N <sub>RB,c</sub> = 66
Downlink initial BWP configuration			DLBWP.0.1	
Downlink dedicated BWP configuration			DLBWP.1.1	
Uplink initial BWP configuration			ULBWP.0.1	
Uplink dedicated BWP configuration			ULBWP.1.1	
DRX cycle configuration	ms		Not applicable	
TRS configuration			TRS.2.1 TDD	
TCI state		TCI.State.0		
AoA setup		Setup 3 defined in A.3.15		
PDSCH Reference measurement channel		-	-	-
RMSI CORESET Reference Channel		-	-	-
OCNG Patterns		OP.1	OP.1	OP.1
SMTC configuration		SMTC.1 FR2	SMTC.1 FR2	SMTC.1 FR2
PDSCH/PDCCH subcarrier spacing	kHz	120	120	120
EPRE ratio of PSS to SSS				
EPRE ratio of PBCH_DMRS to SSS				
EPRE ratio of PBCH to PBCH_DMRS				
EPRE ratio of PDCCH_DMRS to SSS				
EPRE ratio of PDCCH to PDCCH_DMRS	dB	0	0	0
EPRE ratio of PDSCH_DMRS to SSS				
EPRE ratio of PDSCH to PDSCH_DMRS				
EPRE ratio of OCNG DMRS to SSSNote 1				
$\hat{E}_s/N_{oc}$	dB	-0.5	11.0	-3.0

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

Table A.8.5.2.3.2.2-3: SS-SINR Inter-RAT OTA related test parameters

Parameter		Test 1	Test 2	Test 3
Parameter  Angle of arrival configuration		Cell 2	Cell 2	Cell 2
		Setup 1 according to A.3.15.1	Setup 1 according to A.3.15.1	Setup 1 according to A.3.15.1
NR_TDD_FR2_A NR_TDD_FR2_B NR_TDD_FR2_F	dBm/15kHz	-105	-105	Note7 Note7 Note7 Note7
NR_TDD_FR2_T NR_TDD_FR2_Y				Note7 Note7 Note7 Note7
NR TDD FR2 B NR TDD FR2 F NR TDD FR2 G NR TDD FR2 T	dBm/SCS Note3	-96	-96	Note7 Note7 Note7 Note7 Note7
NR TDD FR2 A NR TDD FR2 B NR TDD FR2 F NR TDD FR2 G NR TDD FR2 T NR TDD FR2 Y	dBm/SCS Note4	-96.5	-85	Note8 Note8 Note8 Note8 Note8 Note8 Note8
NR TDD FR2 A NR TDD FR2 B NR TDD FR2 F NR TDD FR2 G NR TDD FR2 T NR TDD FR2 Y	- dB	-0.5	11	-3.0 -3.0 -3.0 -3.0 -3.0 -3.0
	dB	-0.5	11	-3.0
NR TDD FR2 A NR TDD FR2 B NR TDD FR2 F NR TDD FR2 G NR TDD FR2 T NR TDD FR2 Y	dBm/95.04 MHz <sup>Note4</sup>	-69.3	-55.4	Note9 Note9 Note9 Note9 Note9
	In the second se	NR   TDD   FR2   A   NR   TDD   FR2   B   NR   TDD   FR2   F   Note4	NR TDD FR2 A   NR TDD FR2 B   NR TDD FR2 B   NR TDD FR2 B   NR TDD FR2 B   NR TDD FR2 C C C C C C C C C C C C C C C C C C C	NR_TDD_FR2_A   NR_TDD_FR2_B   NR_TDD_FR2_B   NR_TDD_FR2_B   NR_TDD_FR2_B   NR_TDD_FR2_B   NR_TDD_FR2_C   NR_T

- Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  $N_{ac}$  to be fulfilled.
- Note 2: SS-SINR, SS-RSRP, and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
- Note 3: SS-SINR and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.
- Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
- Note 5: As observed with 0 dBi gain antenna at the centre of the guiet zone
- Note 6: NR operating band groups are as defined in clause 3.5.2.
- Note 7:  $N_{oc}$  for SCS 15kHz is applied at level -10log<sub>10</sub>(8)+4dB above the minimum level specified in Table B.2.3-2 for sphereical coverage.  $N_{oc}$  for SCS 120kHz is applied at 4 dB above the minimum level specified in Table B.2.3-2 for sphereical coverage.
- Note 8: SS\_RSRP is applied at level 3dB above the minimum level specified in Table B.2.3-2 for sphereical coverage.
- Note 9: lo is applied at level 10log<sub>10</sub>(792)+6.54dB above the minimum level specified in Table B.2.3-2 for sphereical coverage.

#### A.8.5.2.3.2.3 Test Requirements

The SS-SINR measurement accuracy for Cell 2 shall fulfil the requirement in clause 9.11.3 in TS 36.133 [15].

# Annex B (normative):

# Conditions for RRM requirements applicability for operating bands

# B.1 Conditions for NR RRC\_IDLE state mobility

# B.1.1 Introduction

In Annex B.1, the following conditions are specified:

- UE conditions which shall apply for UE intra-frequency measurements procedures and requirements in clause 4,
- UE conditions which shall apply for UE inter-frequency measurements procedures and requirements in clause 4.

# B.1.2 Conditions for measurements on NR intra-frequency cells for cell re-selection

This clause defines the following conditions for NR intra-frequency measurements performed based on SSBs for cell re-selection: SSB\_RP and SSB £s/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.1.2-1 for FR1 NR cells.

The conditions are defined in Table B.1.2-2 for FR2 NR cells.

Table B.1.2-1: Conditions for intra-frequency cell re-selection in FR1

		Minimum	SSB Ês/lot	
Parameter	NR operating band groups Note1	dBm /	SCS <sub>SSB</sub>	
Parameter	NK operating band groups	SCS <sub>SSB</sub> = 15 kHz	SCS <sub>SSB</sub> = 30 kHz	dB
	NR_FDD_FR1_A, NR_TDD_FR1_A	-124	-121	
	NR_FDD_FR1_B	-123.5	-120.5	
	NR_TDD_FR1_C	-123	-120	
Conditions	NR_FDD_FR1_D, NR_TDD_FR1_D	-122.5	-119.5	≥ -4
	NR_FDD_FR1_E, NR_TDD_FR1_E	-122	-119	
	NR_FDD_FR1_G	-121	-118	
	NR FDD FR1 H	-120.5	-117.5	

Table B.1.2-2: Conditions for intra-frequency cell re-selection in FR2

Parameter		NR		Minimum SSB_RP Note 2, Note 3  dBm / SCSssB					
	Angle of arrival	operating bands		SCS <sub>SSB</sub> =	= 120 kHz		SCS <sub>SSB</sub> = 240 kHz	dB	
				UE Pow	er class		UE Power class		
			1	2	3	4	1, 2, 3, 4		
		n257	- 125.3+Y <sub>1</sub>	-110.8	-109.1	- 124.8+Y <sub>4</sub>			
Rx Bear	Rx Beam	n258	- 125.3+Y <sub>1</sub>	-110.8	-109.1	- 124.8+Y <sub>4</sub>	(Value for SCS <sub>SSB</sub> = 120	≥-4	
	Peak	n260	- 122.3+Y <sub>1</sub>		-106.5	- 122.8+Y <sub>4</sub>	kHz) +3dB	2 <del>-4</del>	
Conditions		n261	- 125.3+Y <sub>1</sub>	-110.8	-109.1	- 124.8+Y <sub>4</sub>			
Conditions		n257	- 117.3+Z <sub>1</sub>	-99.8	-98.2	- 115.8+Z <sub>4</sub>			
	Spherical coverage	n258	- 117.3+Z <sub>1</sub>	-99.8	-98.2	- 115.8+Z <sub>4</sub>	(Value for SCS <sub>SSB</sub> = 120	≥-4	
	Note 1	n260	- 114.3+Z <sub>1</sub>		-93.9	- 110.8+Z <sub>4</sub>	kHz) +3dB		
		n261	- 117.3+Z <sub>1</sub>	-99.8	-98.2	- 115.8+Z <sub>4</sub>			

- NOTE 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.
- NOTE 2: Values specified at the Reference point to give minimum SSB Ês/lot, with no applied noise.
- NOTE 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by ΣMB<sub>P</sub> and Spherical coverage values are increased by ΣMB<sub>S</sub>, the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19].

Editor's notes for Table B.1.2-2:

- The value of Y for Power classes 1 and 4 is FFS, where Y<sub>1</sub> and Y<sub>4</sub> are the rough/fine beam gain differences in Rx beam peak direction for Power classes 1 and 4 respectively
- The value of Z for Power classes 1 and 4 is FFS, where  $Z_1$  and  $Z_4$  are the rough/fine beam gain differences in spherical coverage directions for Power classes 1 and 4 respectively

# B.1.3 Conditions for measurements on NR inter-frequency cells for cell re-selection

This clause defines the following conditions for NR inter-frequency measurements performed based on SSBs for cell re-selection: SSB\_RP and SSB Es/Iot, applicable for a corresponding operating band.

The conditions defined in Table B.1.2-1 for FR1 NR intra-frequency cell re-selection shall also apply for FR1 NR inter-frequency cells in this clause.

The conditions defined in Table B.1.2-2 for FR2 NR intra-frequency cell re-selection shall also apply for FR2 NR inter-frequency cells in this clause.

# B.2 Conditions for UE measurements procedures and performance requirements in RRC\_CONNECTED state

### B.2.1 Introduction

#### B.2.1.1 General

In Annex B.2, the following conditions are specified:

- The conditions for RRC connection release with redirection to NR requirements in clause 6.2.3.2.1,
- The conditions for UE transmit timing adjustment in clause 7.1,
- UE conditions which shall apply for UE intra-frequency measurements procedures and requirements in clause 9, UE conditions which shall apply for UE inter-frequency measurements procedures and requirements in clause 9,
- UE conditions which shall apply for UE intra-frequency measurements performance requirements in clause 10,
- UE conditions which shall apply for UE inter-frequency measurements performance requirements in clause 10.

## B.2.1.2 Derivation of Minimum SSB RP values for FR1

[FFS]

## B.2.1.3 Derivation of Minimum SSB RP values for FR2

### B.2.1.3.1 Minimum SSB RP values for Rx Beam Peak angle of arrival

Minimum SSB\_RP values in Tables B.2.2-2 and B.2.3-2 are based on reference sensitivity for the Operating band and for the UE power class, taking a baseline of UE power class 3 in Band n260 with 50 MHz channel bandwidth.

Minimum SSB\_RP = Reference sensitivity  $_{PC3, n260, 50MHz}$  +Y -10Log $_{10}$ (PRB $_{Refsens}$  x 12) - SNR $_{Refsens}$  + SSB  $\hat{E}s/Iot$  +  $\Sigma MBP$  where:

Reference sensitivity PC3, n260, 50MHz is the reference sensitivity value in dBm specified for power class 3 in Band n260 for 50 MHz Channel bandwidth in Table 7.3.2.3-1 of TS 38.101-2 [19];

Y is the gain difference between fine and rough beams, which is defined in Table B.2.1.3.1-1;

Table B.2.1.3.1-1: Gain difference Y between fine and rough beams, Rx beam peak direction

Value "Y" in dB, for each UE power class								
1	1 2 3 4							
FFS 9.0 7.0 FFS								

PRB<sub>Refsens</sub> is  $N_{RB}$  associated with subcarrier spacing 120 kHz for 50MHz in TS 38.101-2 [19] Table 5.3.2-1, and is 32:

12 is the number of subcarriers in a PRB;

SNR<sub>Refsens</sub> is the SNR used for simulation of Refsens and EIS spherical coverage, and is -1 dB;

SSB Ês/Iot is the minimum value required by the UE to perform measurements, and is -6 dB for intra-frequency measurements and -4 dB for inter-frequency measurements. The only contribution to Iot is the UE internal noise;

 $\Sigma MB_P$  is the UE multi-band relaxation factor value in dB specified in TS 38.101-2 [19] clause 6.2.1.

The calculated Minimum SSB\_RP value for the baseline of UE power class 3 in Band n260 is  $(-109.5 + \Sigma MB_P)$  dBm/120kHz for intra-frequency measurements and  $(-107.5 + \Sigma MB_P)$  dBm/120kHz for inter-frequency measurements.

The following methodology to define the Minimum SSB\_RP level for power class X (PC\_X) and operating band Y (Band Y) is used:

For Intra-frequency: Minimum SSB\_RP (PC\_X, Band\_Y) = -109.5 dBm/120kHz + Refsens  $_{PC_X, Band_Y, 50MHz}$  - Refsens  $_{PC_3, n260, 50MHz}$  + Y  $_{PC_3}$  - Y  $_{PC_3}$  +  $_{DC_3}$  
For Inter-frequency: Minimum SSB\_RP (PC\_X, Band\_Y) = -107.5 dBm/120kHz + Refsens  $_{PC_X, Band_Y, 50MHz}$  - Refsens  $_{PC_3, n260, 50MHz}$  + Y  $_{PC_X}$  - Y  $_{PC_3}$  +  $\Sigma$ MBP.

#### B.2.1.3.2 Minimum SSB\_RP values for angle of arrival within Spherical coverage

Minimum SSB\_RP values in Tables B.2.2-2 and B.2.3-2 are based on EIS spherical coverage for the Operating band and for the UE power class, taking a baseline of UE power class 3 in Band n260 with 50 MHz channel bandwidth.

Minimum SSB\_RP = EIS spherical coverage  $_{PC3, n260, 50MHz}$  +Z -10Log $_{10}$ (PRB $_{Refsens}$  x 12) - SNR $_{Refsens}$  + SSB  $\hat{E}s/Iot$  +  $\Sigma MBs$ .

where:

EIS spherical coverage PC3, n260, 50MHz is the EIS spherical coverage value in dBm specified for power class 3 in Band n260 for 50MHz Channel bandwidth in TS 38.101-2 [19] Table 7.3.4.3-1;

Z is the gain difference between fine and rough beams, and is defined in Table B.2.1.3.2-1;

Table B.2.1.3.2-1: Gain difference Z between fine and rough beams, Spherical coverage directions

Value "Z" in dB, for each UE power class								
1	1 2 3 4							
FFS 9.0 7.0 FFS								

 $PRB_{Refsens}$  is  $N_{RB}$  associated with subcarrier spacing 120 kHz for 50MHz in TS 38.101-2 [19] Table 5.3.2-1, and is 32;

12 is the number of subcarriers in a PRB;

SNR<sub>Refsens</sub> is the SNR used for simulation of Refsens and EIS spherical coverage, and is -1 dB;

SSB Ês/Iot is the minimum value required by the UE to perform measurements, and is -6 dB for intra-frequency measurements and -4 dB for inter-frequency measurements. The only contribution to Iot is the UE internal noise;

ΣMB<sub>s</sub> is the UE multi-band relaxation factor value in dB specified in TS 38.101-2 [19] clause 6.2.1.

The calculated Minimum SSB\_RP value for the baseline of UE power class 3 in Band n260 is  $(-96.9 + \Sigma MB_s)$  dBm/120kHz for intra-frequency measurements and is  $(-94.9 + \Sigma MB_s)$  dBm/120kHz for inter-frequency measurements.

The following methodology to define the Minimum SSB\_RP level for power class X (PC\_X) and operating band Y (Band\_Y) is used:

For Intra-frequency: Minimum SSB\_RP (PC\_X, Band\_Y) =  $(-103.9 + \Sigma MB_S + Z) dBm/120 kHz + Refsens_{PC_X, Band_Y, 50MHz} - Refsens_{PC_3, n260, 50MHz} + Z_{PC_X} - Z_{PC_3} + \Sigma MB_S$ ,

For Inter-frequency: Minimum SSB\_RP (PC\_X, Band\_Y) = (-101.9+ $\Sigma$ MB<sub>S</sub> +Z) dBm/120 kHz + Refsens PC\_X, Band\_Y, 50MHz - Refsens PC3, n260, 50MHz + Z PC\_X - Z PC3 +  $\Sigma$ MB<sub>S</sub>

# B.2.1.4 Gain to SS-RSRP measurement point for FR1

In FR1 conducted requirements are specified at the UE antenna connector, which is also the SS-RSRP measurement point.

## B.2.1.5 Gain to SS-RSRP measurement point for FR2

#### B.2.1.5.1 Gain to SS-RSRP measurement point for Rx Beam Peak angle of arrival

In clause 5.1.1 of TS 38.215 [4] SS-RSRP is defined to be measured based on the combined signal from antenna elements corresponding to a given receiver branch. The reference point for requirement parameters from the UE perspective is the input of the UE antenna array. The gain "G" relates the combined signal from antenna elements corresponding to a given receiver branch to the reference point for requirement parameters.

The gain "G" affects absolute signal level values reported by the UE.

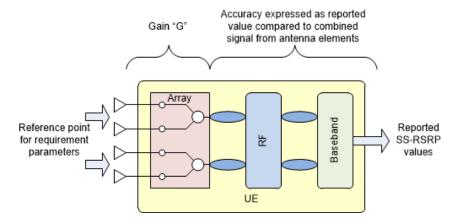


Figure B.2.1.5.1-1: Gain and Reference point for requirement parameters

The gain range for each power class is specified in Table B.2.1.5.1-1.

Table B.2.1.5.1-1: UE gain G, Rx beam peak direction

	UE Power class						
	1 2 3 4						
Minimum, dBi	FFS	FFS	-10	FFS			
Maximum, dBi	FFS FFS +20 FFS						

Gain range in spherical coverage directions may be lower than in Rx beam peak direction, according to the difference between the EIS spherical coverage value specified in TS 38.101-2 [19] clause 7.3.4 and the Reference sensitivity level specified in TS 38.101-2 [19] clause 7.3.2.

# B.2.2 Conditions for NR intra-frequency measurements

This clause defines the following conditions for NR intra-frequency measurements and corresponding procedures performed based on SSBs: SSB RP and SSB £s/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.2.2-1 for FR1 NR cells.

The conditions are defined in Table B.2.2-2 for FR2 NR cells.

Table B.2.2-1: Conditions for intra-frequency measurements in FR1

		Minimum dBm /	SSB Ês/lot	
Parameter	NR operating band groups Note1	SCS <sub>SSB</sub> = 15 kHz	SCS <sub>SSB</sub> = 30 kHz	dB
	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-127	-124	
	NR_FDD_FR1_B	-126.5	-123.5	
Canditions	NR_TDD_FR1_C	-126	-123	> C
Conditions	NR_FDD_FR1_D, NR_TDD_FR1_D	-125.5	-122.5	≥ -6
	NR_FDD_FR1_E, NR_TDD_FR1_E	-125	-122	
	NR_FDD_FR1_G	-124	-121	
	NR_FDD_FR1_H	-123.5	-120.5	
NOTE 1:NR	operating band groups are defined in clause	3.5.2.		•

Table B.2.2-2: Conditions for intra-frequency measurements in FR2

				Minim	num SSB_F	RP Note 2, Note 3		SSB Ês/lot
		ND			dBm / SC	SSSB		
Parameter	Angle of arrival	NR operating		SCS <sub>SSB</sub> =	120 kHz		SCS <sub>SSB</sub> = 240 kHz	-ID
		bands		UE pow	er class		UE power class	dB
			1	2	3	4	1, 2, 3, 4	
		n257	- 128.3+Y <sub>1</sub>	-113.8	-112.1	- 127.8+Y <sub>4</sub>		
	Rx Beam	n258	- 128.3+Y <sub>1</sub>	-113.8	-112.1	- 127.8+Y <sub>4</sub>	(Value for SCS <sub>SSB</sub> = 120 kHz) +3dB	≥-6
	Peak	n260	- 125.3+Y <sub>1</sub>		-109.5	- 125.8+Y <sub>4</sub>		
Conditions		n261	- 128.3+Y <sub>1</sub>	-113.8	-112.1	- 127.8+Y <sub>4</sub>		
Spherical coverage Note 1		n257	- 120.3+Z <sub>1</sub>	-102.8	-101.2	- 118.8+Z <sub>4</sub>		
	•	n258	- 120.3+Z <sub>1</sub>	-102.8	-101.2	- 118.8+Z <sub>4</sub>	(Value for SCS <sub>SSB</sub> = 120	≥-6
		n260	- 117.3+Z <sub>1</sub>		-96.9	- 113.8+Z <sub>4</sub>	kHz) +3dB	≥-0
	n261	- 120.3+Z <sub>1</sub>	-102.8	-101.2	- 118.8+Z <sub>4</sub>			

Note 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.

Note 2: Values specified at the Reference point to give minimum SSB £s/lot, with no applied noise.

Note 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by  $\Sigma MB_P$  and Spherical coverage values are increased by  $\Sigma MB_S$ , the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19].

Editor's notes for Table B.2.2-2:

- The value of Y for power classes 1 and 4 is FFS, where Y<sub>1</sub> and Y<sub>4</sub> are the rough/fine beam gain differences in Rx beam peak direction for power classes 1 and 4 respectively
- The value of Z for power classes 1 and 4 is FFS, where  $Z_1$  and  $Z_4$  are the rough/fine beam gain differences in spherical coverage directions for power classes 1 and 4 respectively

# B.2.3 Conditions for NR inter-frequency measurements

This clause defines the following conditions for NR inter-frequency measurements and corresponding procedures performed based on SSBs: SSB RP and SSB £s/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.2.3-1 for FR1 NR cells.

The conditions are defined in Table B.2.3-2 for FR2 NR cells.

Table B.2.3-1: Conditions for inter-frequency measurements in FR1

		Minimum	SSB_RP	SSB Ês/lot
Parameter	NR operating band groups Note1	dBm / S	SCS <sub>SSB</sub>	
Parameter	NK operating band groups	SCS <sub>SSB</sub> = 15	SCS <sub>SSB</sub> = 30	dB
		kHz	kHz	
	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-125	-122	
	NR_FDD_FR1_B	-124.5	-121.5	
Conditions	NR_TDD_FR1_C	-124	-121	≥ -4
Conditions	NR_FDD_FR1_D, NR_TDD_FR1_D	-124.5	-120.5	≥ -4
	NR_FDD_FR1_E, NR_TDD_FR1_E	-123	-120	
	NR_FDD_FR1_G	-122	-119	
	NR_FDD_FR1_H	-121.5	-118.5	
NOTE 1:NR	operating band groups are defined in clause	3.5.2.		

Table B.2.3-2: Conditions for inter-frequency measurements in FR2

				Minimum SSB_RP Note 2, Note 3					
		ND			dBm / SC	Sssb			
Parameter	Angle of arrival	NR operating		SCS <sub>SSB</sub> =	120 kHz		SCS <sub>SSB</sub> = 240 kHz	-ID	
		bands		UE pow	er class		UE power class	dB	
			1	2	3	4	1, 2, 3, 4		
		n257	- 126.3+Y <sub>1</sub>	-111.8	-110.1	- 125.8+Y <sub>4</sub>			
	Rx Beam Peak	n258	- 126.3+Y <sub>1</sub>	-111.8	-110.1	- 125.8+Y <sub>4</sub>	SCS <sub>SSB</sub> = 120 kHz) +3dB	≥-4	
		n260	- 123.3+Y <sub>1</sub>		-107.5	- 123.8+Y <sub>4</sub>			
Conditions		n261	- 126.3+Y <sub>1</sub>	-111.8	-110.1	- 125.8+Y <sub>4</sub>			
Conditions		n257	- 118.3+Z <sub>1</sub>	-100.8	-99.2	- 116.8+Z <sub>4</sub>			
	Spherical	n258	- 118.3+Z <sub>1</sub>	-100.8	-99.2	- 116.8+Z <sub>4</sub>	(Value for SCS <sub>SSB</sub> = 120	≥-4	
	coverage Note 1	n260	- 115.3+Z <sub>1</sub>		-94.9	- 111.8+Z <sub>4</sub>	kHz) +3dB	<u> </u>	
		n261	- 118.3+Z <sub>1</sub>	-100.8	-99.2	- 116.8+Z <sub>4</sub>			

NOTE 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.

NOTE 2: Values specified at the Reference point to give minimum SSB Ês/lot, with no applied noise.

Editor's notes for Table B.2.3-2:

- The value of Y for power classes 1 and 4 is FFS, where Y<sub>1</sub> and Y<sub>4</sub> are the rough/fine beam gain differences in Rx beam peak direction for power classes 1 and 4 respectively
- The value of Z for power classes 1 and 4 is FFS, where Z<sub>1</sub>, and Z<sub>4</sub> are the rough/fine beam gain differences in spherical coverage directions for power classes 1 and 4 respectively

NOTE 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by ΣMB<sub>P</sub> and Spherical coverage values are increased by ΣMB<sub>S</sub>, the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19].

# B.2.4 Conditions for NR L1-RSRP reporting

# B.2.4.1 Conditions for SSB based L1-RSRP reporting

This clause defines the following conditions for NR L1-RSRP measurement reporting and corresponding procedures performed based on SSBs: SSB\_RP and SSB £s/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.2.4.1-1 for FR1 NR cells.

The conditions are defined in Table B.2.4.1-2 for FR2 NR cells.

Table B.2.4.1-1: Conditions for SSB based L1-RSRP measurements in FR1

		Minimum	SSB_RP	SSB Ês/lot
Parameter	NR operating band groups Note1	dBm /	SCS <sub>SSB</sub>	
Parameter	NA operating band groups	SCS <sub>SSB</sub> = 15 kHz	SCS <sub>SSB</sub> = 30 kHz	dB
	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-124	-121	
	NR_FDD_FR1_B	-123.5	-120.5	
Conditions	NR_TDD_FR1_C	-123	-120	<b>\</b> 0
Conditions	NR_FDD_FR1_D, NR_TDD_FR1_D	-122.5	-119.5	≥ -3
	NR_FDD_FR1_E, NR_TDD_FR1_E	-122	-119	
	NR_FDD_FR1_G	-121	-118	
	NR_FDD_FR1_H	-120.5	-117.5	
NOTE 1:NR	operating band groups are defined in clause	e 3.5.2.		

Table B.2.4.1-2: Conditions for SSB based L1-RSRP measurements in FR2

				SSB Ês/lot				
		ND			dBm / S	CS <sub>SSB</sub>		
Parameter	Angle of arrival	NR operating		SCS <sub>SSB</sub> = 120 kHz			SCS <sub>SSB</sub> = 240 kHz	4D
		bands		UE pow	er class		UE power class	dB
			1	2	3	4	1, 2, 3, 4	
		n257	- 125.3+Y <sub>1</sub>	-110.8	-109.1	- 124.8+Y <sub>4</sub>		
	Rx Beam	n258	- 125.3+Y <sub>1</sub>	-110.8	-109.1	- 124.8+Y <sub>4</sub>	(Value for SCS <sub>SSB</sub> = 120 kHz) +3dB	≥-3
	Peak	n260	- 122.3+Y <sub>1</sub>		-106.5	- 122.8+Y <sub>4</sub>		
Conditions		n261	- 125.3+Y <sub>1</sub>	-110.8	-109.1	- 124.8+Y <sub>4</sub>		
Conditions	Conditions	n257	- 117.3+Z <sub>1</sub>	-99.8	-98.2	- 115.8+Z <sub>4</sub>		
	Spherical coverage	n258	- 117.3+Z <sub>1</sub>	-99.8	-98.2	- 115.8+Z <sub>4</sub>	(Value for SCS <sub>SSB</sub> = 120	≥-3
	Note 1	n260	- 114.3+Z <sub>1</sub>		-93.9	- 110.8+Z <sub>4</sub>	kHz) +3dB	2-0
		n261	- 117.3+Z <sub>1</sub>	-99.8	-98.2	- 115.8+Z <sub>4</sub>		

NOTE 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.

NOTE 2: Values specified at the Reference point to give minimum SSB £s/lot, with no applied noise.

NOTE 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by ΣMB<sub>P</sub> and Spherical coverage values are increased by ΣMB<sub>S</sub>, the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19].

Editor's notes for Table B.2.4.1-2:

<sup>-</sup> The value of Y for power classes 1 and 4 is FFS, where  $Y_1$  and  $Y_4$  are the rough/fine beam gain differences in Rx beam peak direction for power classes 1 and 4 respectively

- The value of Z for power classes 1 and 4 is FFS, where  $Z_1$  and  $Z_4$  are the rough/fine beam gain differences in spherical coverage directions for power classes 1 and 4 respectively

# B.2.4.2 Conditions for CSI-RS based L1-RSRP reporting

This clause defines the following conditions for NR L1-RSRP measurement reporting and corresponding procedures performed based on CSI-RS: CSI-RS\_RP and CSI-RS Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.2.4.2-1 for FR1 NR cells.

The conditions are defined in Table B.2.4.2-2 for FR2 NR cells.

Table B.2.4.2-1: Conditions for CSI-RS based L1-RSRP measurements in FR1

	ND		CSI-RS Ês/lot				
Parameter	NR operating band groups <sup>Note1</sup>		dBm / SCS <sub>CSI-RS</sub>				
	band groups ****	SCS <sub>CSI-RS</sub> = 15 kHz	SCS <sub>CSI-RS</sub> = 30 kHz	SCS <sub>CSI-RS</sub> = 60 kHz	dB		
	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-124	-121	-118			
	NR_FDD_FR1_B	-123.5	-120.5	-117.5			
	NR_TDD_FR1_C	-123	-120	-117			
Conditions	NR_FDD_FR1_D, NR_TDD_FR1_D	-122.5	-119.5	-116.5	≥ -3		
	NR_FDD_FR1_E, NR_TDD_FR1_E	-122	-119	-116			
	NR_FDD_FR1_G	-121	-118	-115			
	NR FDD FR1 H	-120.5	-117.5	-114.5			

Table B.2.4.2-2: Conditions for CSI-RS based L1-RSRP measurements in FR2

				ote 3	CSI-RS Ês/lot				
Parameter	Angle of arrival	NR operating		SCS <sub>CSI-RS</sub>	dBm / SC = 60 kHz	SCSI-RS	SCS <sub>CSI-RS</sub> = 120 kHz		
		bands		UE power class	dB				
			1	2	3	4	1, 2, 3, 4		
	Rx Beam Peak	n257	- 128.3+Y <sub>1</sub>	-113.8	-112.1	- 127.8+Y <sub>4</sub>		≥-3	
		n258	- 128.3+Y <sub>1</sub>	-113.8	-112.1	- 127.8+Y <sub>4</sub>	(Value for SCS <sub>CSI-RS</sub> = 60		
		Peak	n260	- 125.3+Y <sub>1</sub>		-109.5	- 125.8+Y <sub>4</sub>	kHz) +3dB	<u>-</u> -5
Conditions		n261	- 128.3+Y <sub>1</sub>	-113.8	-112.1	- 127.8+Y <sub>4</sub>			
Conditions		n257	- 120.3+Z <sub>1</sub>	-102.8	-101.2	- 118.8+Z <sub>4</sub>			
	Spherical	n258	- 120.3+Z <sub>1</sub>	-102.8	-101.2	- 118.8+Z <sub>4</sub>	(Value for SCS <sub>CSI-RS</sub> = 60	≥-3	
	coverage Note 1	n260	- 117.3+Z <sub>1</sub>		-96.9	- 113.8+Z <sub>4</sub>	kHz) +3dB	2-0	
		n261	- 120.3+Z <sub>1</sub>	-102.8	-101.2	- 118.8+Z <sub>4</sub>			

NOTE 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.

NOTE 2: Values specified at the Reference point to give minimum CSI-RS Es/lot, with no applied noise.

NOTE 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by  $\Sigma MB_P$  and Spherical coverage values are increased by  $\Sigma MB_S$ , the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19].

Editor's notes for Table B.2.4.2-2:

- The value of Y for power classes 1 and 4 is FFS, where  $Y_1$  and  $Y_4$  are the rough/fine beam gain differences in Rx beam peak direction for power classes 1 and 4 respectively
- The value of Z for power classes 1 and 4 is FFS, where  $Z_1$  and  $Z_4$  are the rough/fine beam gain differences in spherical coverage directions for power classes 1 and 4 respectively

# B.2.5 Conditions for RRC connection release with redirection to NR

This clause defines the following conditions for RRC connection release with redirection to NR: SSB\_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.2.5-1 for FR1 NR cells.

The conditions are defined in Table B.2.5-2 for FR2 NR cells.

Table B.2.5-1: Conditions for for RRC connection release with redirection to NR in FR1

		SSB_RP	SSB Ês/lot					
Parameter	NR operating band groups Note1	dBm / S	dBm / SCS <sub>SSB</sub>					
		SCS <sub>SSB</sub> = 15 kHz SCS <sub>SSB</sub> = 30 A -125 -122 -124.5 -121.5		dB				
	NR_FDD_FR1_A, NR_TDD_FR1_A	-125	-122					
	NR_FDD_FR1_B	-124.5	-121.5					
	NR_TDD_FR1_C	-124	-121					
Conditions	NR_FDD_FR1_D, NR_TDD_FR1_D	-124.5	-120.5	≥ -4				
	NR_FDD_FR1_E, NR_TDD_FR1_E	-123	-120					
	NR_FDD_FR1_G	-122	-119					
	NR_FDD_FR1_H	-121.5	-118.5					
NOTE 1: NR operating band groups are defined in clause 3.5.2.								

Table B.2.5-2: Conditions for RRC connection release with redirection to NR in FR2

				Minimum SSB_RP Note 2, Note 3  dBm / SCS <sub>SSB</sub>				
		ND			<u> </u>			
Parameter	Angle of arrival	operating		SCS <sub>SSB</sub> =	SCS <sub>SSB</sub> = 240 kHz			
		bands		UE power class	dB			
			1	2	3	4	1, 2, 3, 4	
	Rx Beam Peak	n257	- 126.3+Y <sub>1</sub>	-111.8	-110.1	- 125.8+Y <sub>4</sub>		≥-4
		n258	- 126.3+Y <sub>1</sub>	-111.8	-110.1	- 125.8+Y <sub>4</sub>	(Value for SCS <sub>SSB</sub> = 120 kHz) +3dB	
		n260	- 123.3+Y <sub>1</sub>		-107.5	- 123.8+Y <sub>4</sub>		
Conditions		n261	- 126.3+Y <sub>1</sub>	-111.8	-110.1	- 125.8+Y <sub>4</sub>		
Conditions		n257	- 118.3+Z <sub>1</sub>	-100.8	-99.2	- 116.8+Z <sub>4</sub>	(Value for SCS <sub>SSB</sub> = 120 kHz) +3dB	
	Spherical coverage Note 1	n258	- 118.3+Z <sub>1</sub>	-100.8	-99.2	- 116.8+Z <sub>4</sub>		≥-4
		n260	- 115.3+Z <sub>1</sub>		-94.9	- 111.8+Z <sub>4</sub>		
		n261	-114.3	-100.8	-99.2	- 116.8+Z <sub>4</sub>		

NOTE 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.

NOTE 2: Values specified at the Reference point to give minimum SSB £s/lot, with no applied noise.

NOTE 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by ΣMB<sub>P</sub> and Spherical coverage values are increased by ΣMB<sub>S</sub>, the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19].

- The value of Y for power classes 1 and 4 is FFS, where  $Y_1$  and  $Y_4$  are the rough/fine beam gain differences in Rx beam peak direction for power classes 1 and 4 respectively
- The value of Z for power classes 1 and 4 is FFS, where  $Z_1$  and  $Z_4$  are the rough/fine beam gain differences in spherical coverage directions for power classes 1 and 4 respectively

# B.2.6 Conditions for UE transmit timing

# B.2.6.1 Conditions for SSB based UE transmit timing

This clause defines the following conditions for UE transmit timing adjustment performed based on SSBs: SSB\_RP and SSB Ês/Iot and applicable for a corresponding operating band.

The conditions are defined in Table B.2.6.1-1 for FR1 SSB.

Table B.2.6.1-1: Conditions for SSB based UE transmit timing in FR1

		Minimum	SSB Ês/lot	
Parameter	NR operating band groups Note1	dBm / S	dD.	
		SCS <sub>SSB</sub> =15 kHz	SCS <sub>SSB</sub> =30 kHz	dB
	NR_FDD_FR1_A, NR_TDD_FR1_A, NR_SDL_FR1_A	-124	-121	
	NR_FDD_FR1_B	-123.5	-120.5	
Conditions	NR_TDD_FR1_C	-123	-120	` 0
Conditions	NR_FDD_FR1_D, NR_TDD_FR1_D	-122.5	-119.5	≥ -3
	NR_FDD_FR1_E, NR_TDD_FR1_E	-122	-119	
	NR_FDD_FR1_G	-121	-118	
	NR_FDD_FR1_H	-120.5	-117.5	
NOTE 1: NF	R operating band groups are defined in cla	ause 3.5.2.	<u>-</u>	-

The conditions are defined in Table B.2.6.1-2 for FR2 SSB.

Table B.2.6.1-2: Conditions for SSB based UE transmit timing in FR2

				Minir	num SSB_	RP Note 2, Note	3	SSB Ês/lot		
		NR			dBm / S	CS <sub>SSB</sub>				
Parameter	Angle of arrival	operating bands		SCS <sub>SSB</sub> = 240 kHz	dB					
		Danus		SCS <sub>SSB</sub> = 120 kHz         kHz           UE power class           1         2         3         4         1, 2, 3, 4           125.3+Y1         -110.8         -109.1         124.8+Y4           125.3+Y1         -106.5         124.8+Y4         (Value for SCS <sub>SSB</sub> = 120 kHz) +3dB           122.3+Y1         -106.5         122.8+Y4         kHz) +3dB						
			1	2	3	4	1, 2, 3, 4			
	Rx Beam Peak	n257	- 125.3+Y <sub>1</sub>	-110.8	-109.1	- 124.8+Y <sub>4</sub>		≥-3		
		n258	- 125.3+Y <sub>1</sub>	-110.8	-109.1	- 124.8+Y <sub>4</sub>	SCS <sub>SSB</sub> = 120			
		n260	- 122.3+Y <sub>1</sub>		-106.5	- 122.8+Y <sub>4</sub>				
Conditions		n261	- 125.3+Y <sub>1</sub>	-110.8	-109.1	- 124.8+Y <sub>4</sub>				
Conditions	Spherical	n257	- 117.3+Z <sub>1</sub>	-99.8	-98.2	- 115.8+Z <sub>4</sub>				
		n258	- 117.3+Z <sub>1</sub>	-99.8	-98.2	- 115.8+Z <sub>4</sub>	(Value for SCS <sub>SSB</sub> = 120	≥-3		
	coverage Note 1	n260	- 114.3+Z <sub>1</sub>		-93.9	- 110.8+Z <sub>4</sub>	kHz) +3dB	0		
		n261	- 117.3+Z <sub>1</sub>	-99.8	-98.2	- 115.8+Z <sub>4</sub>				

- NOTE 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.
- NOTE 2: Values specified at the Reference point to give minimum SSB £s/lot, with no applied noise.
- NOET 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by ΣMB<sub>P</sub> and Spherical coverage values are increased by ΣMB<sub>S</sub>, the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19].

Editor's notes for Table B.2.6.1-2:

- The value of Y for power classes 1 and 4 is FFS, where Y<sub>1</sub> and Y<sub>4</sub> are the rough/fine beam gain differences in Rx beam peak direction for power classes 1 and 4 respectively
- The value of Z for power classes 1 and 4 is FFS, where  $Z_1$  and  $Z_4$  are the rough/fine beam gain differences in spherical coverage directions for power classes 1 and 4 respectively

#### B.2.6.2 Void

# B.3 RRM Requirements Exceptions

### B.3.1 Introduction

Annex B.3 covers exceptions for side conditions based on receiver sensitivity for CA, DC, and SUL.

# B.3.2 Receiver sensitivity relaxation for CA

# B.3.2.1 Receiver sensitivity relaxation for UE supporting CA in FR1

For a UE supporting inter-band carrier aggregation configuration with uplink in NR band, if there is a relaxation of receiver sensitivity  $\Delta R_{IB,c} > 0$  dB as defined in clause 7.3A.3 of TS 38.101-1 [18], the relevant side conditions specifying received power levels (SSB\_RP and Io) shall be increased by the amount  $\Delta = \Delta R_{IB,c}$  defined for the corresponding downlink NR bands.

For a UE supporting CA configuration in FR1, the requirement in this clause applies for both SC and CA operation.

# B.3.2.2 Receiver sensitivity relaxation for UE configured with CA in FR1

#### B.3.2.2.1 Inter-band carrier aggregation

For a UE configured with inter-band carrier aggregation with active uplink in NR band, if there is a relaxation of receiver sensitivity  $\Delta R_{IB,c}>0$  dB as defined in clause 7.3A.3 of TS 38.101-1 [18], the relevant side conditions specifying received power levels (SSB\_RP and Io) shall be increased by the amount  $\Delta=\Delta R_{IB,c}$  defined for the corresponding downlink NR bands.

If the relaxation  $\Delta$  specified in this clause applies, then the relaxation specified in clause B.3.2.1 should not be applied.

#### B.3.2.2.2 Reference sensitivity exceptions due to UL harmonic interference for CA

In this clause, requirements exceptions are described for the UE configured with a band in FR1 when it is impacted by UL harmonic interference from another band in FR1 of the same CA configuration.

A relevant side condition (SSB\_RP and Io) in a requirement shall be increased by the amount  $\Delta$ =L2-L1, where L1 is the reference sensitivity level specified in clause 7.3.2 of TS 38.101-1 [18], and L2 is the reference sensitivity level based on the requirements in clause 7.3A.4 of TS 38.101-1 [18], when the following conditions are fulfilled,

- corresponding downlink component carriers on different NR bands are configured with CA and active,
- the upling is configured in the NR low operating band and is active,
- the uplink configuration is as specified in clause 7.3A.4 of TS 38.101-1 [18], and
- the exception requirements specified in clause 7.3A.4 of TS 38.101-1 [18] apply.

If the relaxation  $\Delta$  specified in this clause applies, then the relaxation specified in clause B.3.2.1 should not be applied.

# B.3.2.2.3 Reference sensitivity exceptions due to intermodulation interference due to 2UL CA

In this clause, requirements exceptions are described for the UE with an inter-band carrier aggregation with uplink assigned to two NR bands.

A relevant side condition (SSB\_RP and Io) in a requirement shall be increased by the amount  $\Delta$ =L2-L1, where L1 is the reference sensitivity level specified in clause 7.3.2 of TS 38.101-1 [18], and L2 is the reference sensitivity level based on the requirements in clause 7.3A.5 of TS 38.101-1 [18], when the following conditions are fulfilled,

- corresponding downlink component carriers on different bands are configured with CA and active,
- uplinks are assigned to two NR bands,
- the exception requirements specified in clause 7.3A.5 of TS 38.101-1 [18] apply.

If the relaxation  $\Delta$  specified in this clause applies, then the relaxation specified in clause B.3.2.1 should not be applied.

# B.3.2.3 Receiver sensitivity relaxation for UE supporting CA in FR2

## B.3.2.4 Receiver sensitivity relaxation for UE configured with CA in FR2

### B.3.2.4.1 Intra-band contiguous carrier aggregation

For a UE configured with intra-band contiguous carrier aggregation in NR band in FR2, if there is a relaxation of receiver sensitivity  $\Delta R_{IB}>0$  dB as defined in clause 7.3A.2.1 of TS 38.101-2 [19] depending on the aggregated channel bandwidth, the relevant side conditions specifying received power levels (SSB\_RP and Io) shall be increased by the amount  $\Delta=\Delta R_{IB}$  defined for the corresponding downlink NR bands.

#### B.3.2.4.2 Intra-band non-contiguous carrier aggregation

For a UE configured with intra-band non-contiguous carrier aggregation in NR band in FR2, if there is a relaxation of receiver sensitivity  $\Delta R_{IB}>0$  dB as defined in clause 7.3A.2.1 of TS 38.101-2 [19] depending on the aggregated channel bandwidth, the relevant side conditions specifying received power levels (SSB\_RP and Io) shall be increased by the amount  $\Delta=\Delta R_{IB}$  defined for the corresponding downlink NR bands.

# B.3.3 Receiver sensitivity relaxation for DC

# B.3.3.1 Receiver sensitivity relaxation for EN-DC

Editor's note: TBD

# B.3.3.2 Receiver sensitivity relaxation for NE-DC

Editor's note: TBD

# B.3.4 Receiver sensitivity relaxation for SUL

# B.3.4.1 Receiver sensitivity relaxation for UE supporting SUL in FR1

For a UE supporting a SUL configuration in FR1, if there is a relaxation of receiver sensitivity  $\Delta R_{IB,c}>0$  dB as defined in clause 7.3C.3 of TS 38.101-1 [18], the relevant side conditions specifying received power levels (SSB\_RP and Io) shall be increased by the amount  $\Delta=\Delta R_{IB,c}$  defined for the corresponding downlink NR bands.

For a UE supporting a SUL configuration in FR1, the requirement in this clause applies for both SC and SUL operation.

# B.3.4.2 Receiver sensitivity relaxation for UE configured with SUL in FR1

#### B.3.4.2.1 Reference sensitivity exceptions due to UL harmonic interference for SUL

In this clause, requirements exceptions are described for the UE with a band in FR1 when it is impacted by UL harmonic interference from another band in FR1 of the same SUL configuration.

A relevant side condition (SSB\_RP and Io) in a requirement shall be increased by the amount  $\Delta$ =L2-L1, where L1 is the reference sensitivity level specified in clause 7.3.2 of TS 38.101-1 [18], and L2 is the reference sensitivity level based on the requirements in clause 7.3C.2 of TS 38.101-1 [18], when the following conditions are fulfilled,

- a downlink component carrier is configured in NR band and is active,
- the upling is configured in the NR low operating band and is active,
- the uplink configuration is as specified in clause 7.3C.2 of TS 38.101-1 [18], and
- the exception requirements specified in clause 7.3C.2 of TS 38.101-1 [18] apply.

If the relaxation  $\Delta$  specified in this clause applies, then the relaxation specified in clause B.3.4.1 should not be applied.

# Annex C (informative): Change history

						Change history	
Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
2017-05	RAN4#83	R4-1706324				Specification skeleton	0.0.1
2017-09						Email approved	0.1.0
2017-09	RAN4-NR AH #3	R4-1709413				Capture TPs approved in the meeting	0.2.0
2017-10	RAN4#84 -Bis	R4-1711985				Capture TPs approved in the meeting	0.3.0
2017-12	RAN4#85	R4-1714546				Capture TPs approved in RAN4#85	0.4.0
2017-12	RAN#78	RP-172407				v1.0.0 submitted for plenary approval	1.0.0
2017-12	RAN#78					Approved by plenary – Rel-15 spec under change control	15.0.0
2018-03	RAN#79	RP-180264	0032		В	CR to TS38.133	15.1.0
2018-06	RAN#80	RP-181075	0037		В	CR to TS 38.133: Implementation of endorsed draft CRs from RAN4 #86bis and RAN4 #87	15.2.0
2018-09	RAN#81	RP-181896	0043		В	CR to TS 38.133: Implementation of endorsed draft CRs from RAN4-AH-1807 and RAN4 #88	15.3.0
2018-12	RAN#82	RP-182763	0057	3	В	CR to TS 38.133: Implementation of endorsed draft CRs from RAN4-88bis and RAN4-89	15.4.0
2019-03	RAN#83	RP-190569	0064	1	В	CR to TS 38.133: Implementation of endorsed draft CRs from RAN4#90	15.5.0
2019-06	RAN#84	RP-191240	0072	1	F	CR to TS 38.133: Implementation of endorsed draft CRs from RAN4#90bis and RAN4#91	15.6.0
2019-09	RAN#85	RP-192022	0084		F	CR to TS 38.133: Implementation of endorsed draft CRs from RAN4#92 (Rel-15)	15.7.0
2019-12	RAN#86	RP-193039	0089		F	Correction to the starting point of the DRX cycle length interval	15.8.0
2019-12	RAN#86	RP-193042	0090		F	CR to 38.133 R15 Add the missing units to DRX cycle values	15.8.0
2019-12		RP-192997	0092	1	F	Specification of UE antenna gain range	15.8.0
2019-12	RAN#86	RP-192992	0094		F	Add RRM Test case setup for 1 AoA in Rx beam peak and 1 in non Rx beam peak	15.8.0
2019-12	RAN#86	RP-192997	0096		F	Update of Parameters, Test case A.7.7.1.1 FR2 Intra-frequency SS-RSRP accuracy	15.8.0
2019-12	RAN#86	RP-192997	0098		F	Update of Parameters, Test case A.5.7.1.1 FR2 Intra-frequency SS-RSRP accuracy	15.8.0
2019-12	RAN#86	RP-192997	0100		F	Update of Parameters, Test case A.7.7.1.2 FR2 Inter-frequency SS-RSRP accuracy	15.8.0
2019-12	RAN#86	RP-192997	0102		F	Update of Parameters, Test case A.5.7.1.2 FR2 Inter-frequency SS-RSRP accuracy	15.8.0
2019-12	RAN#86	RP-192992	0104		F	Correction to Random access test case in FR1 for PSCell in EN-DC	15.8.0
2019-12	RAN#86	RP-193040	0106		F	CR on handover 38.133	15.8.0
2019-12	RAN#86	RP-192994	0108		F	CR on the BWP switch test cases EN-DC FR1 (clause A.4.5.6)	15.8.0
2019-12	RAN#86	RP-192994	0109		F	CR on the BWP switch test cases EN-DC FR2 (clause A.5.5.6)	15.8.0
2019-12	RAN#86	RP-192994	0110		F	CR on the BWP switch test cases SA FR1 (clause A.6.5.6)	15.8.0
2019-12	RAN#86	RP-192994	0111		F	CR on the BWP switch test cases SA FR2 (clause A.7.5.6)	15.8.0
2019-12	RAN#86	RP-193042	0116		F	CR to TS38.133 on correction for BWP switching with SCS	15.8.0
2040 42	DANHOC	DD 402040	0400		-	changing (Clause 8.2.1.2.7, 8.2.2.2.5 and 8.6.2)  CR on handover RRM requirement (clause 6.1.1.5) (R15)	15.8.0
2019-12 2019-12	RAN#86 RAN#86	RP-193040 RP-192994	0120 0122		F	CR on test cases for EN-DC FR2 inter-frequency measurement	15.8.0
						(clause A.5.6.2) (R15)	
2019-12	RAN#86	RP-192994	0126		F	CR on test cases for Redirection from NR in FR2 to NR in FR2 (clause A.7.3.2.3) (R15)	15.8.0
2019-12	RAN#86	RP-192994	0128	1	F	CR on test cases for FR2 handover (clause A.7.3.1) (R15)	15.8.0
2019-12	RAN#86	RP-193042	0130		F	CR to 38.133 on TCl state switching (Clause 8.10) (R15)	15.8.0
2019-12	RAN#86	RP-192994	0136		F	CR on TC with monitoring PDCCH not in first 3 OFDM symbols R15	15.8.0
2019-12	RAN#86	RP-193042	0144		F	Editorial correction for SCell activation and deactivation delay	15.8.0
2019-12	RAN#86	RP-193040	0147		F	CR on inter-RAT measurement in TS38.133 (clause 9.4.2, 9.4.3)	15.8.0
2019-12	RAN#86	RP-193041	0155		F	CR on NR MTTD and MRTD definition for R15	15.8.0
2019-12	RAN#86	RP-193039	0158		F	CR for SCell activation delay in FR2	15.8.0
2019-12	RAN#86	RP-193040	0160	1	F	CR for scheduling restriction due to L1-RSRP measurement	15.8.0
2019-12 2019-12	RAN#86 RAN#86	RP-192993 RP-192995	0166 0168	1	F	CR on SSB setting for new gap and SMTC setting (Clause A.3.10) CR on TS38.133 for EN-DC SS-SINR tests with PSCell in FR1	15.8.0 15.8.0
2019-12	RAN#86	RP-192995	0170		F	(Clause A.4.7.3) CR on TS38.133 for SA SS-SINR tests with PCell in FR1 (Clause	15.8.0
						A.6.7.3)	

						Change history	
Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New
0010 10	D.4.1.110.0	DD 400000	0.10.1				version
2019-12		RP-192993	0184	-	F	CR on cell-reselection test cases for NR SA FR2 R15	15.8.0
2019-12	RAN#86	RP-192995	0186		F	endorsed CR on intra-frequency measurement and reporting for EN-DC FR2 R15	15.8.0
2019-12	RAN#86	RP-192996	0188		F	endorsed CR on intra-frequency measurement and reporting for	15.8.0
2010-12	10.414#00	102330	0 100		'	NR SA FR2 R15	13.0.0
2019-12	RAN#86	RP-192996	0190		F	endorsed CR on RLM scheduling restrictions for EN-DC FR2 R15	15.8.0
2019-12		RP-192996	0192		F	endorsed CR on RLM scheduling restrictions for NR SA FR2 R15	15.8.0
2019-12	RAN#86	RP-192992	0200	1	F	Correction to PRACH configuration index in test cases	15.8.0
2019-12	RAN#86	RP-193039	0208		F	Correction on the TCI state switching (clause 8.10)	15.8.0
2019-12	RAN#86	RP-193039	0214	1	F	CR for 38133 editorial for clause 8.1,8.8,8.9,8.10,8.11 in Rel-15	15.8.0
2019-12	RAN#86	RP-193039	0215	1	F	CR for 38133 editorial for clause 8.5 in Rel-15	15.8.0
2019-12	RAN#86	RP-193039	0216	1	F	CR for 38133 editorial for clause 9.3 in Rel-15	15.8.0
2019-12		RP-193040	0217	1	F	CR on 38133 for removal the duplicated reference in clause 2	15.8.0
2019-12	RAN#86	RP-193040	0218	1	F	CR on 38133 for clause 11 in Rel-15	15.8.0
2019-12	RAN#86	RP-192994	0224	2	F	CR on TC of UE transmit timing (A.4.4.1.1, A.5.4.1.1, A.6.4.1.1,	15.8.0
2019-12	RAN#86	RP-193042	0229	1	F	A.7.4.1.1) Rel-15 Update on requirements related to inter-band EN-DC and NE-DC	15.8.0
2019-12	KAN#80	RP-193042	0229	1		synchronous requirements	15.8.0
2019-12	RAN#86	RP-192995	0232	1	F	Editorial corrections to measurement accuracy tests	15.8.0
2019-12	RAN#86	RP-192992	0234	-	F	Corrections to SS-RSRQ and SS-SINR OTA tests with SA	15.8.0
2019-12	RAN#86	RP-192992	0234		F	Corrections to SS-RSRQ and SS-SINR OTA tests with SA	15.8.0
2019-12	RAN#86	RP-193042	0238	1	F	Editorial corrections to clause 9.2	15.8.0
2019-12		RP-192992	0241	<u> </u>	F	Corrections to band applicability of measurement accuracy tests	15.8.0
2019-12	RAN#86	RP-192996	0243	1	F	Introduction of bandwidth limited OCNG for OTA testing	15.8.0
2019-12	RAN#86	RP-192992	0247	1	F	Corrections to test cases for SA FR2 inter-frequency measurement	
						(clause A.7.6.2)	
2019-12	RAN#86	RP-193041	0249		F	CR to 38.133 NR reporting criteria	15.8.0
2019-12	RAN#86	RP-192993	0263	1	F	CR on correcting CSI-RS based BFD and link recovery tests for	15.8.0
						EN-DC in FR1	
2019-12	RAN#86	RP-192993	0265	1	F	CR on correcting CSI-RS based BFD and link recovery tests for	15.8.0
						SA in FR1	
2019-12	RAN#86	RP-192993	0267	1	F	CR on correcting CSI-RS based BFD and link recovery tests for	15.8.0
0040.40	DANIIIOO	DD 400000	0000	_	_	EN-DC in FR2	45.0.0
2019-12	RAN#86	RP-192993	0269	1	F	CR on correcting CSI-RS based BFD and link recovery tests for SA in FR2	15.8.0
2019-12	RAN#86	RP-193040	0275	1	F	CR on delay uncertainty of RRC Release with redirection	15.8.0
2019-12	KAN#00	KF-193040	0275	'	F	requirements in TS 38.133	15.6.0
2019-12	RAN#86	RP-193040	0277	1	F	CR on known condition of PSCell addition requirement in NE-DC	15.8.0
2019-12			0279	1	F	CR on known condition of PSCell addition requirement in NR DC	15.8.0
2019-12		RP-193041	0281	1	F	CR on RRC Re-establishment requirements in TS 38.133	15.8.0
2019-12	RAN#86	RP-193041	0283	2	F	CR on scope of interruption requirements of EN-DC in TS 38.133	15.8.0
2019-12	RAN#86	RP-193041	0285	1	F	CR on scope of MTTD requirements in TS 38.133	15.8.0
2019-12	RAN#86	RP-192994	0287	1	F	CR on SSB-based RLM test case for EN-DC FR1	15.8.0
2019-12	RAN#86	RP-192994	0289	1	F	CR on SSB-based RLM test case for NR SA FR1	15.8.0
2019-12	RAN#86	RP-193042	0291	1	F	Editorial CR on clause 8.2	15.8.0
2019-12	RAN#86	RP-193041	0295	1	F	CR on NR inter-frequency identification	15.8.0
2019-12	RAN#86	RP-193041	0297	1	F	CR on NR intra-frequency measurements	15.8.0
2019-12	RAN#86	RP-193039	0311	1	F	Correction on CSSF within measurement gap (clause 9.1.5.2)	15.8.0
2019-12	RAN#86	RP-193041	0313		F	CR on RLM scheduling restriction (clause 8.1.7)	15.8.0
2019-12	RAN#86	RP-193041	0315	1	F	CR on SCell activation requirements (clause 8.3.2)	15.8.0
2019-12	RAN#86	RP-193042	0317	1	F	CR to add QCL definition (clause 3.6)	15.8.0
2019-12	RAN#86	RP-192993	0319	1	F	CR on power offset in TRS RMC (A.3.17)	15.8.0
2019-12	RAN#86	RP-192995	0321	1	F	CR to introduce new PDCCH RMC (A.3.1.3.2)	15.8.0
2019-12	RAN#86	RP-192997	0323		F	Maintenance CR for measurement accuracy (clause 10.1)	15.8.0
2019-12	RAN#86	RP-192996	0325		F	FR1 CSI-RS RLM test OOS/IS non-DRX for EN-DC (clause	15.8.0
2019-12	RAN#86	RP-192996	0327	1	F	A.4.5.1)   FR2 CSI-RS RLM test OOS/IS non-DRX for EN-DC (clause	15.8.0
2019-12	11/7/11/#00	111 -132330	0321	'		A.4.5.1)	13.0.0
2019-12	RAN#86	RP-192996	0329	<del>                                     </del>	F	FR1 CSI-RS RLM test OOS/IS non-DRX for SA (clause A.6.5.1)	15.8.0
2019-12	RAN#86	RP-192996	0331	1	F	FR2 CSI-RS RLM test OOS/IS non-DRX for SA (clause A.6.5.1)	15.8.0
2019-12	RAN#86	RP-192997	0333	1	F	L1-RSRP delay test FR1 EN-DC (clause A.4.6.3)	15.8.0
2019-12		RP-192997	0335	† ·	F	L1-RSRP delay test FR2 EN-DC (clause A.5.6.3)	15.8.0
2019-12	RAN#86	RP-192997	0337	1	F	L1-RSRP delay test FR1 SA (clause A.6.6.4)	15.8.0
2019-12	RAN#86	RP-192997	0339		F	L1-RSRP delay test FR2 SA (clause A.7.6.3)	15.8.0
2019-12	RAN#86	RP-192996	0343		F	L1-RSRP accuracy test FR2 EN-DC (clause A.5.7.4)	15.8.0
2019-12	RAN#86	RP-192996	0345		F	L1-RSRP accuracy test FR2 SA (clause A.7.7.4)	15.8.0
2019-12	RAN#86	RP-193039	0357		F	CR 38.133 (8.3.2) Amendment of requirements depending on	15.8.0
						T_SMTC_Max	
2019-12	RAN#86	RP-193039	0359		F	CR 38.133 (8.3.3) Correction of SCell deactivation delay	15.8.0
2019-12	RAN#86	RP-192992	0361		F	CR 38.133 (A.7.5.7) TCs for PSCell addition and release delay	15.8.0

	Change history									
Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version			
2019-12	RAN#86	RP-192995	0365		F	CR to TS 38.133: New common clause with OTA related definitions for FR2 testing (Rel-15)	15.8.0			
2019-12	RAN#86	RP-192995	0367		F	CR to TS 38.133: Configuration of NR FR1 cell in NR FR1-FR2 tests (Rel-15)	15.8.0			
2019-12	RAN#86	RP-192995	0369		F	CR to TS 38.133: Clarificatins to Antenna Configurations for FR2 (Rel-15)	15.8.0			
2019-12	RAN#86	RP-192995	0371		F	CR to TS 38.133: Corrections to CORESET RMCs (Rel-15)	15.8.0			
2019-12	RAN#86	RP-192995	0373		F	CR to TS 38.133: Corrections to FR2 test configurations (Rel-15)	15.8.0			
2019-12	RAN#86	RP-193042	0375	1	F	Editorial updates (clause 9.4)	15.8.0			
2019-12	RAN#86	RP-193039	0377	1	F	Correction in interruption requirements (clause 8.2)	15.8.0			
2019-12	RAN#86	RP-193042	0379	1	F	Editorial updates (Annex B)	15.8.0			
2019-12	RAN#86	RP-193040	0381		F	CR on 38133 for MRTD and MTTD in intra-band EN-DC	15.8.0			
2019-12	RAN#86	RP-192992	0384	1	F	CR for MAC-CE based TCI State switch for ENDC (Clause A.5.5.8)	15.8.0			
2019-12	RAN#86	RP-192993	0385	1	В	CR for MAC-CE based TCI State switch for NR SA (Clause A.7.5.7)	15.8.0			
2019-12	RAN#86	RP-192993	0386	1	В	CR for RRC based TCI State switch for NR SA (Clause A.7.5.7)	15.8.0			
2019-12	RAN#86	RP-192993	0387	1	F	CR for RRC based TCI State switch for EN-DC (Clause A.5.5.8)	15.8.0			
2019-12	RAN#86	RP-192992	0388	1	F	CR for FR1 handover test cases (Clause A.6.3.1.1, A.6.3.1.2, A.6.3.1.3)	15.8.0			
2019-12	RAN#86	RP-193041	0389	1	F	CR on MTTD for intra-band EN-DC	15.8.0			
2019-12	RAN#86	RP-193040	0397		F	CR on corrections on NR intra frequency measurement reporting requirements (Clause 9.2.4)	15.8.0			

# History

	Document history							
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