7   NR standalone with at least one NR cell in FR2

7.0   General

This section contains test scenarios for NR standalone. This configuration is also known as NR/5GC. At least one NR cell is in Frequency Range 2.

For conformance testing involving FR2 test cases in this specification, the UE under test shall be pre-configured with UL Tx diversity schemes disabled to account for single polarization System Simulator (SS) in the test environment. The UE under test may transmit with dual polarization.

7.1   RRC_IDLE state mobility

7.1.1   NR cell re-selection

7.1.1.0   Minimum conformance requirements

7.1.1.0.1   Minimum conformance requirements for intra-frequency cell re-selection

The cell re-selection delay shall be less than $T_{evaluate\ NR\_Intra} + T_{SI-NR}$ in RRC_IDLE state.

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

The UE shall be able to evaluate whether a newly detectable intra-frequency cell meets the reselection criteria defined in TS38.304 [30] within T_{detect,NR_Intra} as defined in table 4.2.2.3-1 of TS 38.133 [6] when that Treselection= 0. An intra frequency cell is considered to be detectable according to the conditions defined in Annex B.1.2 of TS 38.133 [6] for a corresponding Band.

The UE shall measure SS-RSRP and SS-RSRQ at least every $T_{measure,NR\_Intra}$ (see table 4.2.2.3-1 of TS 38.133 [6]) for intra-frequency cells that are identified and measured according to the measurement rules.

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

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

For an intra-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the intra-frequency cell has met reselection criterion defined within $T_{evaluate,NR\_Intra}$ when $T_{reselection} = 0$ as specified in table 4.2.2.3-1 of TS 38.133 [6] provided that the cell has at least [3]dB better ranked.

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

If $T_{reselection}$ timer has a non-zero value and non-zeroa-frequency cell is satisfied with the reselection criteria which are defined in TS38.304 [30], the UE shall evaluate this intra-frequency cell for the $T_{reselection}$ time. If this cell remains satisfied with the reselection criteria within this duration, then the UE shall reselect that cell.

The normative reference for this requirement is TS 38.133 [6] clause 4.2.2.2 and 4.2.2.3.

7.1.1.0.2   Minimum conformance requirements for inter-frequency cell re-selection

The cell re-selection delay shall be less than $T_{evaluate\ NR\_Intra} + T_{SI-NR}$ in RRC_IDLE state.

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

If $S_{rxlev} > S_{nonIntraSearchP}$ and $S_{qual} > S_{nonIntraSearchQ}$ then the UE shall search for inter-frequency layers of higher priority at least every $T_{higher\_priority\_search}$ where $T_{higher\_priority\_search}$ is described in clause 4.2.2.7 of TS 38.133 [6].

If $S_{rxlev} \leq S_{nonIntraSearchP}$ or $S_{qual} \leq S_{nonIntraSearchQ}$ 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 subclause.

The UE shall be able to evaluate whether a newly detectable inter-frequency cell meets the reselection criteria defined in TS38.304 [30] within $K_{carrier} * T_{detect,NR\_Inter}$ if at least carrier frequency information is provided for inter-frequency neighbour cells by the serving cells when $T_{reselection} = 0$ provided that the reselection criteria is met by a margin of at least [5] dB for reselections based on ranking or [6]dB for SS-RSRP reselections based on absolute priorities or [4]dB for SS-RSRQ reselections based on absolute priorities. The parameter $K_{carrier}$ is the number of NR inter-frequency carriers indicated by the serving cell. An inter-frequency cell is considered to be detectable according to the conditions defined in Annex B.1.3 of TS 38.133 [6] for a corresponding Band.

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

The UE shall measure SS-RSRP or SS-RSRQ at least every $K_{carrier} * T_{measure,NR\_Inter}$ (see table 4.2.2.4-1 of TS 38.133 [6]) for identified lower or equal priority inter-frequency cells. If the UE detects on a NR carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

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

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

For an inter-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the inter-frequency cell has met reselection criterion defined TS 38.304 [30] within $K_{carrier} * T_{evaluate,NR\_Inter}$ when $T_{reselection} = 0$ as specified in table 4.2.2.4-1 of TS 38.133 [6] provided that the reselection criteria is met by

- the condition when performing equal priority reselection and the cell has at least [5]dB better ranked

- [6]dB for SS-RSRP reselections based on absolute priorities or

- [4]dB for SS-RSRQ reselections based on absolute priorities.

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

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

The UE is not expected to meet the measurement requirements for an inter-frequency carrier under DRX cycle=320 ms defined in Table 4.2.2.4-1 of TS 38.133 [6] under the following conditions:

- $T_{SMTC\_intra} = T_{SMTC\_inter} = 160$ ms; where T_{SMTC_intra} and T_{SMTC_inter} are periodicities of the SMTC occasions configured for the intra-frequency carrier and the inter-frequency carrier respectively,

- SMTC occasions configured for the inter-frequency carrier occur up to TBD ms before the start or up to TBD ms after the end of the SMTC occasions configured for the intra-frequency carrier and

- SMTC occasions configured for the intra-frequency carrier and for the inter-frequency carrier occur up to TBD ms before the start or up to TBD ms after the end of the paging occasion [1].

The normative reference for this requirement is TS 38.133 [6] clause 4.2.2.4.

7.1.1.0.3 Minimum conformance requirements for intra-frequency cell re-selection for UE configured with relaxed measurement criterion

The cell re-selection delay shall be less than $T_{evaluate\ NR\_Intra} + T_{SI-NR}$ in RRC_IDLE state.

7.1.1.0.3.1 Introduction

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

- Relaxed measurement criterion for UE with low mobility defined in clause 5.2.4.9.1 in TS 38.304 [30],

- Relaxed measurement criterion for UE not-at-cell edge defined in clause 5.2.4.9.2 in TS 38.304 [30],

- Both low mobility criterion and not-at-cell edge criterion as defined in clauses 5.2.4.9.1 and 5.2.4.9.2 in TS 38.304 [30] respectively.

7.1.1.0.3.2 Measurements for UE fulfilling low mobility criterion

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

- UE is configured with *lowMobilityEvaluation* [13] criterion and UE has fulfilled, or

- UE is configured with both *lowMobilityEvaluation* [13] criterion and *cellEdgeEvaluation* [13] criterion and *combineRelaxedMeasCondition* [13] not configured, and UE has fulfilled only the *lowMobilityEvaluation* [13] criterion.

The requirements defined in clause 7.1.1.0.1 apply for this clause except that:

- T_{detect,NR_Intra} as specified in Table 4.2.2.9.2-1 in TS 38.133 [6].

- $T_{measure,NR\_Intra}$ as specified in Table 4.2.2.9.2-1 in TS 38.133 [6].

- $T_{evaluate,NR\_Intra}$ as specified in Table 4.2.2.9.2-1 in TS 38.133 [6].

7.1.1.0.3.3 Measurements for UE fulfilling not-at-cell edge criterion

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

- UE is configured with *cellEdgeEvaluation* [13] criterion and UE has fulfilled, or

- UE is configured with both *lowMobilityEvaluation* [13] criterion and *cellEdgeEvaluation* [13] criteria and *combineRelaxedMeasCondition* [13] not configured, and UE has fulfilled only the *cellEdgeEvaluation* [13] criterion.

The requirements defined in clause 7.1.1.0.1 apply for this clause except that:

- T_{detect,NR_Intra} as specified in Table 4.2.2.9.3-1 in TS 38.133 [6].

- $T_{measure,NR\_Intra}$ as specified in Table 4.2.2.9.3-1 in TS 38.133 [6].

- $T_{evaluate,NR\_Intra}$ as specified in Table 4.2.2.9.3-1 in TS 38.133 [6].

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

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

- UE is configured with both *lowMobilityEvaluation* [13] criterion and *cellEdgeEvaluation* [13] criterion, and

- has also fulfilled both criteria, and

- less than 1 hour have passed since measurements for cell reselection were last performed

In this case the UE is not required to meet T_{detect,NR_Intra}, $T_{measure,NR\_Intra}$ and $T_{evaluate,NR\_Intra}$ as defined in Table 4.2.2.3-1 of TS 38.133[6].

The normative reference for this requirement is TS 38.133 [6] clause 4.2.2.9.

7.1.1.0.4 Minimum conformance requirements for inter-frequency cell re-selection for UE configured with relaxed measurement criterion

The cell re-selection delay shall be less than $T_{evaluate\ NR\_Inter} + T_{SI-NR}$ in RRC_IDLE state.

7.1.1.0.4.1 Introduction

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

- Relaxed measurement criterion for UE with low mobility defined in clause 5.2.4.9.1 in TS 38.304 [30],

- Relaxed measurement criterion for UE not-at-cell edge defined in clause 5.2.4. 9.2 in TS 38.304 [30],

- Both low mobility criterion and not-at-cell edge criterion as defined in clauses 5.2.4. 9.1 and 5.2.4.9.2 in TS 38.304 [30] respectively.

7.1.1.0.4.2 Measurements for UE fulfilling low mobility criterion

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

- T331 timer is not running for EMR measurements on inter-frequency NR carrier, and

- UE is configured with *lowMobilityEvaluation* [13] criterion and UE has fulfilled, or

- UE is configured with both *lowMobilityEvaluation* [13] and *cellEdgeEvaluation* [13] criterion and *combineRelaxedMeasCondition* [13] not configured, and UE has fulfilled only the *lowMobilityEvaluation* [13] criterion.

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

- T_{detect,NR_Inter} as specified in Table 4.2.2.10.2-1 in TS 38.133 [6].

- $T_{measure,NR\_Inter}$ as specified in Table 4.2.2.10.2-1 in TS 38.133 [6].

- $T_{evaluate,NR\_Inter}$ as specified in Table 4.2.2.10.2-1 in TS 38.133 [6].

When $Srxlev > S_{nonIntraSearchP}$ and $Squal > S_{nonIntraSearchQ}$ and the UE is configured with *highPriorityMeasRelax* [13] then the UE shall search for inter-frequency layers of higher priority at least every $K2*T_{higher\_priority\_search}$ where $T_{higher\_priority\_search}$ is described in clause 4.2.2.7 and, K2 = 60. Otherwise if the UE is not configured with *highPriorityMeasRelax* [13] then the UE shall search for inter-frequency layers of higher priority at least every $T_{higher\_priority\_search}$ where $T_{higher\_priority\_search}$ is described in clause 4.2.2.7 of TS 38.133[6].

7.1.1.0.4.3 Measurements for UE fulfilling not-at-cell edge criterion

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

- T331 timer is not running for EMR measurements on inter-frequency NR carrier, and

- UE is configured with *cellEdgeEvaluation* [13] criterion, and UE has fulfilled or

- UE is configured with both *lowMobilityEvaluation* [13] criterion and *cellEdgeEvaluation* [13] criterion and *combineRelaxedMeasCondition* [13] not configured, and UE has fulfilled only the *cellEdgeEvaluation* [13] criterion.

When $Srxlev \leq S_{nonIntraSearchP}$ or $Squal \leq S_{nonIntraSearchQ}$ then te requirements defined in clause 4.2.2.4 apply for this clause except that:

- T_{detect,NR_Inter} as specified in Table 4.2.2.10.3-1 in TS 38.133 [6].

- $T_{measure,NR\_Inter}$ as specified in Table 4.2.2.10.3-1 in TS 38.133 [6].

- $T_{evaluate,NR\_Inter}$ as specified in Table 4.2.2.10.3-1 in TS 38.133 [6].

When Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ and regardless of whether the UE is configured with *highPriorityMeasRelax* [13] or not, 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

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

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

- T331 timer is not running for EMR measurements on inter-frequency NR carrier, and

- UE is configured with both *lowMobilityEvaluation* [13] criterion and *cellEdgeEvaluation* [13] criterion, and

- Has also fulfilled both criteria, and

- less than 1 hour have passed since measurements for cell reselection were last performed

In this case the UE is not required to meet T_{detect,NR_Inter}, $T_{measure,NR\_Inter}$ and $T_{evaluate,NR\_Inter}$ as defined in Table 4.2.2.4-1 of TS 38.133[6].

The normative reference for this requirement is TS 38.133 [6] clause 4.2.2.10.

7.1.1.1   NR SA FR2 cell re-selection

Editor's Note: This test case is complete for the following configurations:

- Test frequency f ≤ 40.8 GHz.

- UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

7.1.1.1.1   Test purpose

The purpose of this test is to verify the requirement for the intra frequency NR cell reselection requirements specified in TS 38.133 clause 4.2.2.3.

7.1.1.1.2   Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.1.1.1.3   Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.1.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.1.1.1.

7.1.1.1.4   Test description

7.1.1.1.4.1   Initial conditions

This test shall be run in one of the configurations defined in Table 7.1.1.1.4.1-1.

Table 7.1.1.1.4.1-1: Supported test configurations for NR SA FR2 cell re-selection

Configuration	Description
7.1.1.1-1	120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
7.1.1.1-2	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.

Configure the test equipment and the DUT according to the parameters in Table 7.1.1.1.4.1-2.

Table 7.1.1.1.4.1-2: Initial conditions for NR SA FR2 cell re-selection

Parameter	Value			Comment
Test environment	NC			As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.			
Channel bandwidth	As specified by the test configuration selected from Table 7.1.1.1.4.1-1.			
Propagation conditions	AWGN			As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1		As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1		
Exceptions to connection diagram	N/A			

1. The general test parameter settings are set up according to Table 7.1.1.1.4.1-3.

2. Message contents are defined in clause 7.1.1.1.4.3.

3. There is one NR carrier and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is the neighbour cell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

Table 7.1.1.1.4.1-3: General test parameters for NR SA FR2 cell re-selection

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2	Cell1	
T2 end condition	Active cell		1, 2	Cell2	
	Neighbour cells		1, 2	Cell1	
Final condition	Active cell		1, 2	Cell1	
	Neighbour cell		1, 2	Cell2	
RF Channel Number			1, 2	1	
Time offset between cells			1, 2	3 μs	Synchronous cells
Access Barring Information		-	1, 2	Not Sent	No additional delays in random access procedure.
SMTC configuration			1, 2	SMTC.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	>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 re-selection reaction time is taken into account.
T3		s	1, 2	35	T3 needs to be defined so that cell re-selection reaction time is taken into account.

7.1.1.1.4.2   Test procedure

Two cells are deployed in the test, which are one FR2 NR PCell (Cell 1) and an NR neighbour cell (Cell 2) on the same frequency. The test consists of 3 successive time periods, with time duration of T1, T2, and T3 respectively. Only cell 1 is already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing cell 2.

In the following test procedure "UE responds" means "UE starts transmitting preamble on PRACH for sending the RRC SETUP REQUEST message to perform a Registration procedure for mobility.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR*, connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1. Set Cell 2 physical cell identity = initial Cell 2 physical cell identity.

2. Set the parameters according to T1 in Table 7.1.1.1.5-1. T1 starts.

3. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) for one iteration of the test procedure loop.

4. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.1.1.1.5-1.

5. The SS waits for random access requests information from the UE to perform cell re-selection to a newly detectable cell, Cell 2.

6. If the UE responds on the newly detectable cell, Cell 2 during time duration T2 within 130 seconds from the beginning of time period T2, then count a success for the event "Re-select newly detected Cell 2". Otherwise count a fail for the event "Re-select newly detected Cell 2".

7. If the UE has re-selected Cell 2 within T2, after the re-selection or when T2 expires, continue with step 7a. Otherwise, if T2 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 12.

7a. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.

8. The SS shall switch the power setting from T2 to T3 as specified in Table 7.1.1.1.5-1.

9. The SS waits for random access requests information from the UE to perform cell re-selection to an already detected cell, Cell 1.

10. If the UE responds on the already detected cell, Cell 1 during time duration T3 within 27 seconds from the beginning of time period T3, then count a success for the event "Re-select already detected Cell 1". Otherwise count a fail for the event "Re-select already detected Cell 1".

11. If the UE has re-selected Cell 1 within T3, after the re-selection or when T3 expires, continues with step 11a. Otherwise, if T3 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 12.

11a. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.

12. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR*, connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1.

13. Repeat step 2-12 until a test verdict has been achieved.
    Each of the events "Re-select newly detected Cell 2" and "Re-select already detected Cell 1" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict.
    If both events pass, the test passes. If one event fails, the test fails.

7.1.1.1.4.3   Message contents

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

Table 7.1.1.1.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	Table H.2.1-2
Default RRC messages and information elements contents exceptions	

Table 7.1.1.1.4.3-1A: SIB1 (Cell 1 and Cell 2)

Derivation Path: Table H.2.1-3			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB1 ::= SEQUENCE {			
cellSelectionInfo SEQUENCE {			
q-RxLevMin	-60	Actual value is -60*2 = -120dBm	7.1.1.1-1
	-58	Actual value is -58*2 = -116dBm	7.1.1.1-2
}			
}			

Table 7.1.1.1.4.3-1B: SIB2 (Cell 1 and Cell 2)

Derivation Path: Table H.2.1-1 with condition SMTC.1 and Synchronous cells			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB2 ::= SEQUENCE {			
intraFreqCellReselectionInfo SEQUENCE {			
q-RxLevMin	-60	Actual value is -60*2 = -120dBm	7.1.1.1-1
	-58	Actual value is -58*2 = -116dBm	7.1.1.1-2
s-IntraSearchP	25	Actual value is 25*2 = 50dB	
}			
}			

Table 7.1.1.1.4.3-2: *RACH-ConfigGeneric*: NR cell re-selection

Derivation Path: TS 38.508-1 [14], Table 4.6.3-130			
Information Element	**Value/remark**	**Comment**	**Condition**
RACH-ConfigGeneric ::= SEQUENCE {			
prach-ConfigurationIndex	190		
}			

7.1.1.1.5 Test requirement

Tables 7.1.1.1.4.1-3 and 7.1.1.1.5-1 define the primary level settings including test tolerances for intra frequency NR cell re-selection test case.

Table 7.1.1.1.5-1: Cell specific test parameters for NR SA FR2 cell re-selection

Parameter	Unit	Test config.	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
TDD configuration		1, 2	TDDConf.3.1			TDDConf.3.1		
PDSCH RMC configuration		1	SR.3.1 TDD			SR.3.1 TDD		
		2	SR.3.1 TDD			SR.3.1 TDD		
RMSI CORESET RMC configuration		1	CR.3.1 TDD			CR.3.1 TDD		
		2	CR.3.1 TDD			CR.3.1 TDD		
Dedicated CORESET RMC configuration		1	CCR.3.1 TDD			CCR.3.1 TDD		
		2	CCR.3.1 TDD			CCR.3.1 TDD		
SSB configuration		1	SSB.3 FR2			SSB.7 FR2		
		2	SSB.4 FR2			SSB.8 FR2		
OCNG Pattern		1, 2	OP.4			OP.4		
Initial DL BWP configuration		1, 2	DLBWP.0.1			DLBWP.0.1		
BWchannel	MHz	1, 2	100: NRB,c = 66			100: NRB,c = 66		
Data RBs allocated		1, 2	66			66		
Initial UL BWP configuration		1, 2	ULBWP.0.1			ULBWP.0.1		
RLM-RS		1, 2	SSB			SSB		
Qrxlevmin	dBm/SCS	1	-120[Note 6]			-120[Note 6]		
		2	-117[Note 6]			-117[Note 6]		
Pcompensation	dB	1, 2	0			0		
Qhyst$_s$	dB	1, 2	0			0		
Qoffset$_{s, n}$	dB	1, 2	0			0		
Cell_selection_and_ reselection_quality_measurement		1, 2	SS-RSRP			SS-RSRP		
AoA setup		1, 2	Setup 1 defined in A. 9.1			Setup 1 defined in A. 9.1		
Beam assumption[Note 4]		1,2	Rough					
$\hat{E}_s/I_{ot\,BB}$ [Note 5]	dB	1	7.56	-3.34	1.61	-infinity	1.61	-3.34
		2						
N_{oc} [Note2]	dBm/SCS	1	-93					
		2	-90					
N_{oc} [Note2]	dBm/15 kHz	1	-102					
		2						
$\hat{E}_s / N_{oc}$	dB	1	8	-2.9[Note 6]	2.05[Note 6]	-infinity	2.05[Note 6]	-2.9[Note 6]
		2						
SS-RSRP [Note3]	dBm/SCS	1	-85	-95.9	-90.9	-infinity	-90.9	-95.9
		2	-82	-92.9	-87.9	-infinity	-87.9	-92.9
Io	dBm/95.04 MHz	1	-60.53	-67.37	-65.01	-69.17	-65.01	-67.37
		2	-57.52	-64.39	-62.33	-66.16	-62.33	-64.39
Treselection	s	1, 2	0	0	0	0	0	0
SintrasearchP	dB	1, 2	50			50		
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.

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.

Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

Note 5: Calculation of Es/Iot$_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMB$_P$ from TS 38.101-2 [19] Table 6.2.1.3-4.

Note 6: Including the test tolerance given in Annex F.

The cell re-selection delay to a newly detectable cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the RRC SETUP REQUEST message to perform a Registration procedure for mobility on Cell 2.

The cell re-selection delay to a newly detectable cell test requirement in this case is expressed as:

Cell re-selection delay to a newly detectable cell = $T_{detect,NR\_Intra} + T_{SI-NR}$

T_{detect,NR_Intra} = 128 s; as specified in TS 38.133 [6] clause 4.2.2.3.

T_{SI-NR} = 1280 ms; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

The cell re-selection delay to a newly detectable cell shall be less than a total of 129.28 seconds in this test case (note: this gives a total of 129.28 seconds but the test allows 130 seconds).

The cell re-selection delay to an already detected cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on Cell 1, and starts to send preambles on the PRACH for sending the RRC SETUP REQUEST message to perform a Registration procedure for mobility on Cell 1.

The cell re-selection delay to an already detected cell test requirement in this case is expressed as:

Cell re-selection to an already detected cell delay = $T_{evaluate,NR\_Intra} + T_{SI-NR}$

$T_{evaluate,NR\_Intra}$ = 25.6 s; as specified in TS 38.133 [6] clause 4.2.2.3.

T_{SI-NR} = 1280 ms; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

The cell re-selection delay to an already detected cell shall be less than a total of 26.88 seconds in this test case (note: this gives a total of 26.88 seconds but the test allows 27 seconds).

For the test to pass, both events above shall pass.

The statistical pass/ fail decisions are done separated for each event. For an event to pass, the total number of successful loops shall be more than 90% of the cases with a confidence level of 95%.

7.1.1.2   NR SA FR2-FR2 cell re-selection

Editor's Note: This test case is complete for the following configurations:

-    Test frequency f ≤ 40.8 GHz.

-    UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

7.1.1.2.1   Test purpose

The purpose of this test is to verify the requirement for the inter frequency NR cell reselection requirements specified in TS 38.133 clause 4.2.2.4.

7.1.1.2.2   Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.1.1.2.3   Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.1.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.1.1.2.

7.1.1.2.4   Test description

7.1.1.2.4.1   Initial conditions

This test shall be run in one of the configurations defined in Table 7.1.1.2.4.1-1.

Table 7.1.1.2.4.1-1: Supported test configurations for NR SA FR2-FR2 cell re-selection

Configuration	Description for serving cell	Description for target cell
7.1.1.2-1	120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode	120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
7.1.1.2-2	240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode	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.	

Configure the test equipment and the DUT according to the parameters in Table 7.1.1.2.4.1-2.

Table 7.1.1.2.4.1-2: Initial conditions for NR SA FR2-FR2 cell re-selection

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.1.1.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 7.1.1.2.4.1-3.

2. Message contents are defined in clause 7.1.1.2.4.3.

3. There is two NR carrier and 2 NR Cells specified in the test. Cell 2 is the PCell and Cell 1 is the neighbour cell in a different carrier than cell 2. Cell 1 and Cell 2 are configured according to Annex C.1.2.

Table 7.1.1.2.4.1-3: General test parameters for NR SA FR2-FR2 cell re-selection

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
	Neighbour cell		1, 2	Cell1	
T1 end condition	Active cell		1, 2	Cell1	The UE shall perform reselection to cell 1 during T1
	Neighbour cells		1, 2	Cell2	
T3 end condition	Active cell		1, 2	Cell2	The UE shall perform reselection to cell 2 with higher priority during T3
	Neighbour cell		1, 2	Cell1	
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.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 re-selection 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.
T3		s	1, 2	95	T3 needs to be defined so that cell re-selection reaction time is taken into account.

7.1.1.2.4.2 Test procedure

The test consists of one active cell and one neighbour cell. The UE is requested to monitor the neighbouring cell on one of the NR carriers. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas and cell 2 is of higher priority than cell 1. Furthermore, UE has not registered with network for the tracking area containing cell 1.

In the following test procedure "UE responds" means "UE starts transmitting preamble on PRACH for sending the RRC SETUP REQUEST message to perform a Registration procedure for mobility".

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR*, connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 2.

2. Set the parameters according to T1 in Table 7.1.1.2.5-1. Propagation conditions are set according to Annex B clause B.1.1. T1 starts.

3. Void.

4. The SS waits for random access requests information from the UE to perform cell re-selection on the lower priority cell, Cell 1.

5. If the UE responds on lower priority cell, Cell 1 during time duration T1 within 27 seconds from the beginning of time period T1, then count a success for the event "Re-select lower priority Cell 1". Otherwise count a fail for the event "Re-select lower priority Cell 1".

6. If the UE has re-selected Cell 1 within T1, after the re-selection or when T1 expires, continue with step 6a. Otherwise, if T1 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 12.

6a. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.

7. The SS shall switch the power setting from T1 to T2 as specified in Table 7.1.1.2.5-1. During time duration T2, Cell 2 shall be powered OFF and the physical cell identity = ((current Cell 2 physical cell identity + 1) mod 1008) shall be changed to ensure Cell 2 is not detected by the UE.

8. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 7.1.1.2.5-1.

9. The SS waits for random access requests information from the UE to perform cell re-selection on the higher priority cell, Cell 2.

10. If the UE responds on higher priority cell, Cell 2 during time duration T3 within 87 seconds from the beginning of time period T3, then count a success for the event "Re-select higher priority Cell 2". Otherwise count a fail for the event "Re-select higher priority Cell 2".

11. If the UE has re-selected Cell 2 within T3, after the re-selection or when T3 expires, continues with step 11a. Otherwise, if T3 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and continue with step 12.

11a. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.

12. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR*, connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 2.

13. Repeat step 3-12 until a test verdict has been achieved.
Each of the events "Re-select lower priority Cell 1" and "Re-select higher priority Cell 2" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict.
If both events pass, the test passes. If one event fails, the test fails.

7.1.1.2.4.3 Message contents

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

Table 7.1.1.2.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	Table H.2.2-1 for NR Cell 1
Default RRC messages and information elements contents exceptions	

Table 7.1.1.2.4.3-2: *RACH-ConfigGeneric*: NR cell re-selection

Derivation Path: TS 38.508-1 [14], Table 4.6.3-130			
Information Element	**Value/remark**	**Comment**	**Condition**
RACH-ConfigGeneric ::= SEQUENCE {			
prach-ConfigurationIndex	190		
}			

Table 7.1.1.2.4.3-3: SIB1 (Cell 1 and Cell 2)

Derivation Path: Table H.2.2-3			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB1 ::= SEQUENCE {			
cellSelectionInfo SEQUENCE {			
q-RxLevMin	-70	Actual value is -62*2 = -140dBm	7.1.1.2-1 and Cell 1
	-68	Actual value is -62*2 = -136dBm	7.1.1.2-2 and Cell 1
	-62	Actual value is -62*2 = -124dBm	7.1.1.2-1 and Cell 2
	-60	Actual value is -62*2 = -120dBm	7.1.1.2-2 and Cell 2
}			
}			

Table 7.1.1.2.4.3-4: SIB2(Cell2)

Derivation Path: Table H.2.2-1 with condition NR Cell 2			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB2 ::= SEQUENCE {			
cellReselectionServingFreqInfo SEQUENCE {			
s-NonIntraSearchP	31	Actual value is 31*2 = 62dBm	
threshServingLowP	31	Actual value is 31*2 = 62dBm	
}			
}			

Table 7.1.1.2.4.3-5: SIB4 (Cell 1)

Derivation Path: Table H.2.2-2 with condition NR Cell 1, SMTC.1 and Synchronous cells			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB4 ::= SEQUENCE {			
interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo {	1 Entry		
InterFreqCarrierFreqInfo[1] SEQUENCE {		Entry 1	
q-RxLevMin	-70	Actual value = -70*2 = -140dBm	7.1.1.2-1
	-68	Actual value = -68*2 = -136dBm	7.1.1.2-2
threshX-HighP	16	Actual value is 16*2 = 32dBm	
}			
}			
}			

Table 7.1.1.2.4.3-6: SIB4 (Cell 2)

Derivation Path: Table H.2.2-2 with condition NR Cell 2, SMTC.1 and Synchronous cells			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB4 ::= SEQUENCE {			
interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo {	1 Entry		
InterFreqCarrierFreqInfo[1] SEQUENCE {		Entry 1	
q-RxLevMin	-62	Actual value = -62*2 = -124dBm	7.1.1.2-1
	-60	Actual value = -60*2 = -120dBm	7.1.1.2-2
threshX-LowP	9	Actual value = 9*2 = 18dBm	
}			
}			
}			

7.1.1.2.5 Test requirement

Tables 7.1.1.2.4.1-3 and 7.1.1.2.5-1 define the primary level settings including test tolerances for inter frequency NR cell re-selection test case.

Table 7.1.1.2.5-1: Cell specific test parameters for NR SA FR2-FR2 cell re-selection

Parameter	Unit	Test configuration	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
TDD configuration		1, 2	TDDConf.3.1			TDDConf.3.1		
PDSCH RMC configuration		1, 2	SR.3.1 TDD			SR.3.1 TDD		
RMSI CORESET parameters		1, 2	CR.3.1 TDD			CR.3.1 TDD		
RMSI CORESET RMC configuration		1, 2	CCR.3.1 TDD			CCR.3.1 TDD		
OCNG Pattern		1, 2	OP.1			OP.1		
Initial DL BWP configuration		1, 2	DLBWP.0.1			DLBWP.0.1		
BWchannel	MHz	1, 2	100: NRB,c = 66			100: NRB,c = 66		
Data RBs allocated		1, 2	66			66		
Initial UL BWP configuration		1, 2	ULBWP.0.1			ULBWP.0.1		
RLM-RS		1, 2	SSB			SSB		
Qrxlevmin	dBm/SCS	1	-140			-124 [Note 6]		
		2	-137			-121 [Note 6]		
Pcompensation	dB	1, 2	0			0		
Qhyst$_s$	dB	1, 2	0			0		
Qoffset$_{s, n}$	dB	1, 2	0			0		
Cell_selection_and_ reselection_quality_measurement		1, 2	SS-RSRP			SS-RSRP		
AoA setup		1, 2	Setup 1 defined in A. 9.1			Setup 1 defined in A. 9.1		
Beam assumption[Note 4]		1,2	Rough					
$\hat{E}_s/I_{ot\,BB}$ [Note 5]	dB	1	810.06	810.06	87.56	-3-3.34	-infinity	88.06
		2						
N_{oc} [Note2]	dBm/SCS	1	-93					
		2	-90					
N_{oc} [Note2]	dBm/15 kHz	1	-102					
		2						
$\hat{E}_s / N_{oc}$	dB	1	810.5	810.5	8	-3-2.9 [Note 6]	-infinity	88.5
		2						
SS-RSRP [Note3]	dBm/SCS	1	-85-82.5	-85-82.5	-85	-96-95.9	-infinity	-85-84.5
		2	-82-79.5	-82-79.5	-82	-93-92.9	-infinity	-82-91.5
Io	dBm/95.04 MHz	1	-55.37-53.11	-55.37-53.11	-55.37-55.34	-62.25-62.18	-infinity-63.98	-55.37-54.91
		2	-53.11-52.37	-53.11-52.37	-55.34-52.37	-62.18-59.25	63.98-infinity	-54.91-52.37
Treselection	s	1, 2	0	0	0	0	0	0
SnonintrasearchP	dB	1, 2	50			62 [Note 6]		
Thresh$_{x, highP}$	dB	1, 2	32 [Note 6]			48		
Thresh$_{serving, lowP}$	dB	1, 2	44			62 [Note 6]		
Thresh$_{x, lowP}$	dB	1, 2	50			18 [Note 6]		
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.

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.

Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

Note 5: Calculation of Es/Iot$_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMB$_P$ from TS 38.101-2 [19] Table 6.2.1.3-4.

Note 6: Including the test tolerance given in Annex F.

The cell reselection delay to a higher priority cell is defined as the time from the beginning of time period T3, to the moment when the UE camps again on cell 2, and starts to send preambles on the PRACH for sending the RRC SETUP REQUEST message to perform a Registration procedure for mobility on cell 2.

The cell re-selection delay to a higher priority cell test requirement in this case is expressed as:

Cell re-selection delay to a higher priority cell = $T_{higher\_priority\_search} + T_{evaluate, NR\_inter} + T_{SI-NR}$

$T_{higher\_priority\_search} = 60$ s, as specified in TS 38.133 [6] clause 4.2.2.7;

$T_{evaluate, NR\_inter} = 25.6$ s, as specified in TS 38.133 [6] clause 4.2.2.4;

$T_{SI-NR} = 1280$ ms; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

The cell re-selection delay to a higher priority cell shall be less than a total of 86.88 seconds in this test case (note: this gives a total of 86.88 seconds but this test allows 87 seconds)

The cell reselection delay to a lower priority cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 1, and starts to send preambles on the PRACH for sending the RRC SETUP REQUEST message to perform a Registration procedure for mobility on cell 1.

The cell re-selection delay to a lower priority cell test requirement in this case is expressed as:

Cell re-selection delay to a lower priority cell = $T_{evaluate, NR\_inter} + T_{SI-NR}$

$T_{evaluate, NR\_inter} = 25.6$ s, as specified in TS 38.133 [6] clause 4.2.2.4;

$T_{SI-NR} = 1280$ ms; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

The cell re-selection delay to a lower priority cell shall be less than a total of 26.88 seconds in this test case (note: this gives a total of 26.88 seconds but this test allows 27 seconds)

For the test to pass, both events above shall pass.

The statistical pass/fail decisions are done separated for each event. For an event to pass, the total number of successful loops shall be more than 90% of the cases with a confidence level of 95%.

7.1.1.3 NR SA FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

Editor's Note: This test case is complete for the following configurations:

- Test frequency f ≤ 40.8 GHz.

- UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

7.1.1.3.1 Test purpose

The purpose of this test is to verify the requirement for the intra frequency NR cell reselection requirements when UE fulfils the low mobility relaxed measurement criterion specified in TS 38.133 clause 4.2.2.9.

7.1.1.3.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards supporting relaxed RRM measurement.

7.1.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.1.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.7.1.1.3.

7.1.1.3.4   Test description

7.1.1.3.4.1   Initial conditions

This test shall be run in one of the configurations defined in Table 7.1.1.3.4.1-1.

Table 7.1.1.3.4.1-1: Supported test configurations for NR SA FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

Configuration	Description
7.1.1.3-1	120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
7.1.1.3-2	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.

Configure the test equipment and the DUT according to the parameters in Table 7.1.1.3.4.1-2.

Table 7.1.1.3.4.1-2: Initial conditions for NR SA FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.1.1.3.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.6.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.2	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 7.1.1.3.4.1-3.

2. Message contents are defined in clause 7.1.1.3.4.3.

3. There is one NR carrier and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is the neighbour cell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

Table 7.1.1.3.4.1-3: General test parameters for NR SA FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2	Cell1	The UE camps on cell 1 in the initial phase
	Neighbour cells		1, 2	Cell2	
T1 end condition	Active cell		1, 2	Cell2	The UE reselects to cell 2 during T1 period
	Neighbour cells		1, 2	Cell1	
Final condition	Active cell		1, 2	Cell1	The UE reselects to cell 1 during T2 period
	Neighbour cells		1,2	Cell2	

RF Channel Number		1, 2	1	
Time offset between cells		1, 2	3 μs	Synchronous cells
Access Barring Information	-	1, 2	Not Sent	No additional delays in random access procedure.
SMTC configuration		1, 2	SMTC pattern 1	
DRX cycle length	s	1, 2	0.64	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	100	
T2	s	1, 2	100	

7.1.1.3.4.2 Test procedure

Two cells are deployed in the test, which are one FR2 NR PCell (Cell 1) and an NR neighbour cell (Cell 2) on the same frequency. The test consists of 2 successive time periods, with time duration of T1, T2 respectively. Both cell 1 and cell2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas.

The UE is configured only low mobility criterion defined in clause 5.2.4.9.1 in TS 38.304 [30]. So, Cell 1 configures the UE as follows:

- *lowMobilityEvaluation* [2] is configured according to the parameters listed in Table 7.1.1.3.5-1;

- *cellEdgeEvaluation* [2] is not configured;

- *combineRelaxedMeasCondition* [2] is not configured

In the following test procedure "UE responds" means "UE starts transmitting preamble on PRACH for sending the RRC SETUP REQUEST message to perform a Registration procedure for mobility.

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

2. Set the parameters according to T1 in Table 7.1.1.3.5-1. T1 starts.

3. The SS waits for random access requests information from the UE to perform cell re-selection to Cell 2.

4. If the UE responds on Cell 2 during time duration T1 within 100 seconds from the beginning of time period T1, then count a success for cell reselection. Otherwise count a fail for cell reselection.

5. If the UE has re-selected Cell 2 within T1, after the re-selection or when T1 expires, continue with step 6. Otherwise, if T1 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 10.

5a The SS shall send an RRCConnectionRelease to ensure that the UE is in state RRC_IDLE.

6. The SS shall switch the power setting from T1 to T2 as specified in Table 7.1.1.3.5-1. T2 starts.

7. The SS waits for random access requests information from the UE to perform cell re-selection to an already detected cell, Cell 1.

8. If the UE responds to Cell 1 during time duration T2 within 100 seconds from the beginning of time period T2, then count a success for cell reselection. Otherwise count a fail for cell reselection.

9. If the UE has re-selected Cell 1 within T2, after the re-selection or when T2 expires, continue with step 10. Otherwise, if T2 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and continue with step 10.

10. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

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

7.1.1.3.4.3 Message contents

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

Table 7.1.1.3.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	Table H.2.1-2
Default RRC messages and information elements contents exceptions	

Table 7.1.1.3.4.3-2: *RACH-ConfigGeneric*: NR cell re-selection

Derivation Path: TS 38.508-1 [14], Table 4.6.3-130			
Information Element	**Value/remark**	**Comment**	**Condition**
RACH-ConfigGeneric ::= SEQUENCE {			
prach-ConfigurationIndex	190		
}			

Table 7.1.1.3.4.3-2A: SIB1 (Cell 1 and Cell 2)

Derivation Path: Table H.2.1-3			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB1 ::= SEQUENCE {			
cellSelectionInfo SEQUENCE {			
q-RxLevMin	-60	Actual value is -60*2 = -120dBm	7.1.1.3-1
	-58	Actual value is -58*2 = -116dBm	7.1.1.3-2
}			
}			

Table 7.1.1.3.4.3-3: SIB2

Derivation Path: Table H.2.1-1 with condition SMTC.1 and Synchronous cells			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB2 ::= SEQUENCE {			
intraFreqCellReselectionInfo SEQUENCE {			
q-RxLevMin	-60	Actual value is -60*2 = -120dBm	7.1.1.3-1
	-58	Actual value is -58*2 = -116dBm	7.1.1.3-2
s-IntraSearchP	25	Actual value is 25*2 = 50dB	
}			
relaxedMeasurement-r16 SEQUENCE {			
lowMobilityEvaluation-r16 SEQUENCE {			
s-SearchDeltaP-r16	dB6		
t-SearchDeltaP-r16	s5		
}			
cellEdgeEvaluation-r16	Not present		
combineRelaxedMeasCondition-r16	Not present		
highPriorityMeasRelax-r16	Not present		
}			
}			

7.1.1.3.5 Test requirement

Tables 7.1.1.3.4.1-3 and 7.1.1.3.5-1 define the primary level settings including test tolerances for intra frequency NR cell re-selection test case for UE fulfilling low mobility relaxed measurement criterion.

Table 7.1.1.3.5-1: Cell specific test parameters for NR SA FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

Parameter	Unit	Test configuration	Cell 1		Cell 2	
			T1	T2	T1	T2
TDD configuration		1, 2	TDDConf.3.1		TDDConf.3.1	
PDSCH RMC configuration		1	SR.3.1 TDD		SR.3.1 TDD	
		2	SR.3.1 TDD		SR.3.1 TDD	
RMSI CORESET RMC configuration		1	CR.3.1 TDD		CR.3.1 TDD	
		2	CR.3.1 TDD		CR.3.1 TDD	
Dedicated CORESET RMC configuration		1	CCR.3.1 TDD		CCR.3.1 TDD	
		2	CCR.3.1 TDD		CCR.3.1 TDD	
SSB configuration		1	SSB.3 FR2		SSB.7 FR2	
		2	SSB.4 FR2		SSB.8 FR2	
OCNG Pattern		1, 2	OP.4		OP.4	
$BW_{channel}$	MHz	1, 2	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
Data RBs allocated		1, 2	66		66	
Initial DL BWP configuration		1, 2	DLBWP.0.1		DLBWP.0.1	
Initial UL BWP configuration		1, 2	ULBWP.0.1		ULBWP.0.1	
RLM-RS		1, 2	SSB		SSB	
Qrxlevmin	dBm/SCS	1	-120 Note 6		-120 Note 6	
		2	-117 Note 6		-117 Note 6	
$S_{SearchDeltaP}$	dB	1, 2	6		6	
$T_{SearchDeltaP}$	s	1,2	5		5	
Pcompensation	dB	1, 2	0		0	
Qhyst$_s$	dB	1, 2	0		0	
Qoffset$_{s, n}$	dB	1, 2	0		0	
Cell_selection_and_ reselection_quality_measurement		1, 2	SS-RSRP		SS-RSRP	
AoA setup		1, 2	Setup 1 defined in A.3.15.1		Setup 1 defined in A.3.15.1	
Beam assumption[Note 4]		1,2	Rough		Rough	
$\hat{E}_s/I_{ot\,BB}$ [Note 5]	dB	1	-3.34	1.61	1.61	-3.64
		2				
N_{oc} [Note2]	dBm/SCS	1	-93			
		2	-90			
N_{oc} [Note2]	dBm/15 kHz	1	-102			
		2				
$\hat{E}_s / N_{oc}$	dB	1	-2.9[Note 6]	2.05 [Note 6]	2.05 Note 6	-2.9 [Note 6]
		2				
SS-RSRP [Note3]	dBm/SCS	1	-95.9	-90.9	-90.9	-95.9
		2	-92.9	-87.9	-87.9	-92.9
Io on SSB symbols of each cell	dBm/95.04 MHz	1	-67.37	-65.01	-65.01	-67.37
		2	-64.36	-62.00	-62.00	-64.36

Treselection	s	1, 2	0	0	0	0
SintrasearchP	dB	1, 2	50		50	
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.

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.

Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

Note 5: Calculation of Es/Iot$_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMB$_P$ from TS 38.101-2 [19] Table 6.2.1.3-4.

Note 6: Including the test tolerance given in Annex F.

The cell reselection delay to an already detected cell for UE fulfilling low mobility relaxed criterion 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 reselection delay to an already detected cell for UE fulfilling low mobility relaxed criterion is also defined as the time from the beginning of time period T2, 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 79 s.

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

The cell re-selection delay to an already detected cell test requirement in this case is expressed as:

Cell re-selection to an already detected cell delay = $T_{evaluate,NR\_Intra} + T_{SI-NR}$

$T_{evaluate,NR\_Intra}$ = 76.8 s; as specified in TS 38.133 [6] clause 4.2.2.9.

T_{SI-NR} = 1280 ms; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

This gives a total of 78.08 s, allow 79s for the cell re-selection delay to an already detected cell for UE fulfilling low mobility criterion in the test case.

7.1.1.4 NR SA FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

Editor's Note: This test case is complete for the following configurations:

- Test frequency f ≤ 40.8 GHz.

- UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

7.1.1.4.1 Test purpose

The purpose of this test is to verify the requirement for the intra frequency NR cell reselection requirements when UE fulfils the not-at-cell edge relaxed measurement criterion specified in TS 38.133 clause 4.2.2.9.

7.1.1.4.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards supporting relaxed RRM measurement.

7.1.1.4.3   Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.1.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.7.1.1.4.

7.1.1.4.4   Test description

7.1.1.4.4.1   Initial conditions

This test shall be run in one of the configurations defined in Table 7.1.1.4.4.1-1.

Table 7.1.1.4.4.1-1: Supported test configurations for NR SA FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

Configuration	Description
7.1.1.4-1	120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
7.1.1.4-2	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.

Configure the test equipment and the DUT according to the parameters in Table 7.1.1.4.4.1-2.

Table 7.1.1.4.4.1-2: Initial conditions for NR SA FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.1.1.4.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.6.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.2	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 7.1.1.4.4.1-3.

2. Message contents are defined in clause 7.1.1.4.4.3.

3. There is one NR carrier and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is the neighbour cell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

Table 7.1.1.4.4.1-3: General test parameters for NR SA FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2	Cell1	The UE camps on cell 1 in the initial phase
	Neighbour cells		1, 2	Cell2	
T1 end condition	Active cell		1, 2	Cell2	The UE reselects to cell 2 during T1 period
	Neighbour cells		1, 2	Cell1	
Final condition	Active cell		1, 2	Cell1	
	Neighbour cells		1,2	Cell2	

RF Channel Number		1, 2	1	
Time offset between cells		1, 2	3 μs	Synchronous cells
Access Barring Information	-	1, 2	Not Sent	No additional delays in random access procedure.
SMTC configuration		1, 2	SMTC pattern 1	
DRX cycle length	s	1, 2	0.64	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	100	
T2	s	1, 2	100	

7.1.1.4.4.2 Test procedure

Two cells are deployed in the test, which are one FR2 NR PCell (Cell 1) and an NR neighbour cell (Cell 2) on the same frequency. The test consists of 2 successive time periods, with time duration of T1, T2 respectively. Both cell 1 and cell2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas.

The UE is configured only not-at-cell edge criterion defined in clause 5.2.4.9.1 in TS 38.304 [30]. So, Cell 1 configures the UE as follows:

- *lowMobilityEvaluation* [2] is not configured;

- *cellEdgeEvaluation* [2] is configured according to the parameters listed in Table 7.1.1.4.5-1;

- *combineRelaxedMeasCondition* [2] is not configured

In the following test procedure "UE responds" means "UE starts transmitting preamble on PRACH for sending the RRC SETUP REQUEST message to perform a Registration procedure for mobility.

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

2. Set the parameters according to T1 in Table 7.1.1.4.5-1. T1 starts.

3. The SS waits for random access requests information from the UE to perform cell re-selection to Cell 2.

4. If the UE responds on Cell 2 during time duration T1 within 100 seconds from the beginning of time period T1, then count a success for cell reselection. Otherwise count a fail for cell reselection.

5. If the UE has re-selected Cell 2 within T1, after the re-selection or when T1 expires, continue with step 6. Otherwise, if T1 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 10.

5a The SS shall send an RRCConnectionRelease to ensure that the UE is in state RRC_IDLE.

6. The SS shall switch the power setting from T1 to T2 as specified in Table 7.1.1.4.5-1. T2 starts.

7. The SS waits for random access requests information from the UE to perform cell re-selection to an already detected cell, Cell 1.

8. If the UE responds to Cell 1 during time duration T2 within 100 seconds from the beginning of time period T2, then count a success for cell reselection. Otherwise count a fail for cell reselection.

9. If the UE has re-selected Cell 1 within T2, after the re-selection or when T2 expires, continue with step 10. Otherwise, if T2 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and continue with step 10.

10. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

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

7.1.1.4.4.3 Message contents

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

Table 7.1.1.4.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	Table H.2.1-2
Default RRC messages and information elements contents exceptions	

Table 7.1.1.4.4.3-2: *RACH-ConfigGeneric*: NR cell re-selection

Derivation Path: TS 38.508-1 [14], Table 4.6.3-130			
Information Element	**Value/remark**	**Comment**	**Condition**
RACH-ConfigGeneric ::= SEQUENCE {			
prach-ConfigurationIndex	190		
}			

Table 7.1.1.4.4.3-2A: SIB1 (Cell 1 and Cell 2)

Derivation Path: Table H.2.1-3			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB1 ::= SEQUENCE {			
cellSelectionInfo SEQUENCE {			
q-RxLevMin	-60	Actual value is -60*2 = -120dBm	7.1.1.4-1
	-58	Actual value is -58*2 = -116dBm	7.1.1.4-2
}			
}			

Table 7.1.1.4.4.3-3: SIB2 (Cell 1 and Cell 2)

Derivation Path: Table H.2.1-1 with condition SMTC.1 and Synchronous cells			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB2 ::= SEQUENCE {			
intraFreqCellReselectionInfo SEQUENCE {			
q-RxLevMin	-60	Actual value is -60*2 = -120dBm	7.1.1.4-1
	-58	Actual value is -58*2 = -116dBm	7.1.1.4-2
s-IntraSearchP	25	Actual value is 25*2 = 50dB	
relaxedMeasurement-r16 SEQUENCE {			
lowMobilityEvaluation-r16	Not present		
cellEdgeEvaluation-r16 SEQUENCE {			
s-SearchThresholdP-r16	4	Actual value is 4*2 = 8dBm	
}			
combineRelaxedMeasCondition-r16	Not present		
highPriorityMeasRelax-r16	Not present		
}			
}			

7.1.1.4.5 Test requirement

Tables 7.1.1.4.4.1-3 and 7.1.1.4.5-1 define the primary level settings including test tolerances for intra frequency NR cell re-selection test case for UE fulfilling not-at-cell edge relaxed measurement criterion.

Table 7.1.1.4.5-1: Cell specific test parameters for NR SA FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

Parameter	Unit	Test configuration	Cell 1		Cell 2	
			T1	T2	T1	T2
TDD configuration		1, 2	TDDConf.3.1		TDDConf.3.1	
PDSCH RMC configuration		1	SR.3.1 TDD		SR.3.1 TDD	
		2	SR.3.1 TDD		SR.3.1 TDD	
RMSI CORESET RMC configuration		1	CR.3.1 TDD		CR.3.1 TDD	
		2	CR.3.1 TDD		CR.3.1 TDD	
Dedicated CORESET RMC configuration		1	CCR.3.1 TDD		CCR.3.1 TDD	
		2	CCR.3.1 TDD		CCR.3.1 TDD	
SSB configuration		1	SSB.3 FR2		SSB.7 FR2	
		2	SSB.4 FR2		SSB.8 FR2	
OCNG Pattern		1, 2	OP.4		OP.4	
BW$_{channel}$	MHz	1, 2	100: N$_{RB,c}$ = 66		100: N$_{RB,c}$ = 66	
Data RBs allocated		1, 2	66		66	
Initial DL BWP configuration		1, 2	DLBWP.0.1		DLBWP.0.1	
Initial UL BWP configuration		1, 2	ULBWP.0.1		ULBWP.0.1	
RLM-RS		1, 2	SSB		SSB	
Qrxlevmin	dBm/SCS	1	-120 [Note 6]		-120 [Note 6]	
		2	-117 [Note 6]		-117 [Note 6]	
Pcompensation	dB	1, 2	0		0	
Qhyst$_s$	dB	1, 2	0		0	
Qoffset$_{s, n}$	dB	1, 2	0		0	
Cell_selection_and_reselection_quality_measurement		1, 2	SS-RSRP		SS-RSRP	
AoA setup		1, 2	Setup 1 defined in A.3.15.1		Setup 1 defined in A.3.15.1	
Beam assumption[Note 4]		1,2	Rough		Rough	
$\hat{E}_s/I_{ot\,BB}$ [Note 5]	dB	1	-3.34	1.61	1.61	-3.34
		2				
N_{oc} [Note2]	dBm/SCS	1	-93			
		2	-90			
N_{oc} [Note2]	dBm/15 kHz	1	-102			
		2				
$\hat{E}_s / N_{oc}$	dB	1	-2.90 [Note 6]	2.05 [Note 6]	2.05 [Note 6]	-2.90 [Note 6]
		2				
SS-RSRP [Note3]	dBm/SCS	1	-95.9	-90.9	-90.9	-95.9
		2	-92.9	-87.9	-87.9	-92.9
Io on SSB symbols of each cell	dBm/95.04 MHz	1	-67.37	-65.01	-65.01	-67.37
		2	-64.36	-62.00	-62.00	-64.36

Treselection	s	1, 2	0	0	0	0
S$_{SearchThresholdP}$		1, 2	8 Note 6	8 Note 6	8 Note 6	8 Note 6
SintrasearchP	dB	1, 2	50		50	
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.

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.

Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

Note 5: Calculation of Es/Iot$_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMB$_P$ from TS 38.101-2 [19] Table 6.2.1.3-4.

Note 6: Including the test tolerance given in Annex F.

The cell reselection delay to an already detected cell for UE fulfilling not-at-cell edge relaxed criterion 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 reselection delay to an already detected cell for UE fulfilling not-at-cell edge relaxed criterion is also defined as the time from the beginning of time period T2, 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 79 s.

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

The cell re-selection delay to an already detected cell test requirement in this case is expressed as:

Cell re-selection to an already detected cell delay = T$_{evaluate,NR\_Intra}$ + T$_{SI-NR}$

T$_{evaluate,NR\_Intra}$ = 76.8 s; as specified in TS 38.133 [6] clause 4.2.2.9.

T$_{SI-NR}$ = 1280 ms; maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell is assumed in this test.

This gives a total of 78.08 s, allow 79s for the cell re-selection delay to an already detected cell for UE fulfilling not-at-cell edge criterion in the test case.

7.1.1.5 NR SA FR2-FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

Editor's Note: This test case is complete for the following configurations:

- Test frequency f ≤ 40.8 GHz.

- UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

7.1.1.5.1 Test purpose

The purpose of this test is to verify the requirement for the inter frequency NR cell reselection requirements when UE fulfils the low mobility relaxed measurement criterion specified in TS 38.133 clause 4.2.2.10.

7.1.1.5.2   Test applicability

This test applies to all types of NR UE from Release 16 onwards supporting relaxed RRM measurement.

7.1.1.5.3   Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.1.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.7.1.1.5.

7.1.1.5.4   Test description

7.1.1.5.4.1   Initial conditions

This test shall be run in one of the configurations defined in Table 7.1.1.5.4.1-1.

Table 7.1.1.5.4.1-1: Supported test configurations for NR SA FR2-FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

Configuration	Description
7.1.1.5-1	120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
7.1.1.5-2	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.

Configure the test equipment and the DUT according to the parameters in Table 7.1.1.5.4.1-2.

Table 7.1.1.5.4.1-2: Initial conditions for NR SA FR2-FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.1.1.5.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.6.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.2	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 7.1.1.5.4.1-3.

2. Message contents are defined in clause 7.1.1.5.4.3.

3. There is one NR carrier and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is the neighbour cell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

Table 7.1.1.5.4.1-3: General test parameters for NR SA FR2-FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2	Cell2	The UE camps on cell2 and fulfils low mobility (*lowMobilityEvalutation* [2]) criterion.
	Neighbour cell		1, 2	Cell1	
T1 final condition	Active cell		1, 2	Cell1	The UE reselects to low priority cell1 during T1
	Neighbour cell		1, 2	Cell2	
T2 final condition	Active cell		1, 2	Cell2	The UE reselects to high priority cell2 during T2
	Neighbour cell			Cell1	

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	0.64	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	85	T1 needs to be long enough to allow cell re-selection to already known cell1
T2	s	1, 2	85	T2 needs to be long enough to allow cell re-selection to already known cell2

7.1.1.5.4.2   Test procedure

The test consists of one active cell and one neighbour cell. The UE is requested to monitor the neighbouring cell on one of the NR carriers. The test consists of two successive time periods, with time duration of T1, T2 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.

The UE is configured only low mobility criterion defined in clause 5.2.4.9.1 in TS 38.304 [30]. So, Cell 1 configures the UE as follows:

- *lowMobilityEvaluation* [2] is configured according to the parameters listed in Table 7.1.1.5.5-1;

- *cellEdgeEvaluation* [2] is not configured;

- *combineRelaxedMeasCondition* [2] is not configured

In the following test procedure "UE responds" means "UE starts transmitting preamble on PRACH for sending the RRC SETUP REQUEST message to perform a Registration procedure for mobility.

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

2. Set the parameters according to T1 in Table 7.1.1.5.5-1. T1 starts.

3. The SS waits for random access requests information from the UE to perform cell re-selection to Cell 1.

4. If the UE responds on lower priority Cell 1 during time duration T1 within 85 seconds from the beginning of time period T1, then count a success for the event "Re-select lower priority Cell 1". Otherwise count a fail for the event "Re-select lower priority Cell 1"

5. If the UE has re-selected Cell 1 within T1, after the re-selection or when T1 expires, continue with step 6. Otherwise, if T1 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 10.

5a The SS shall send an RRCConnectionRelease to ensure that the UE is in state RRC_IDLE.

6. The SS shall switch the power setting from T1 to T2 as specified in Table 7.1.1.5.5-1. T2 starts.

7. The SS waits for random access requests information from the UE to perform cell re-selection to an already detected cell, Cell 2.

8. If the UE responds to higher priority Cell 2 during time duration T2 within 85 seconds from the beginning of time period T2, then count a success for the event "Re-select higher priority Cell 2". Otherwise count a fail for the event "Re-select higher priority Cell 2"

9. If the UE has re-selected Cell 2 within T2, after the re-selection or when T2 expires, continue with step 10. Otherwise, if T2 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and continue with step 10.

10. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat step 2-10 until a test verdict has been achieved.
    Each of the events "Re-select lower priority Cell 1" and "Re-select higher priority Cell 2" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict.
    If both events pass, the test passes. If one event fails, the test fails.

7.1.1.5.4.3 Message contents

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

Table 7.1.1.5.4.3-1: Common Exception messages

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

Table 7.1.1.5.4.3-2: *RACH-ConfigGeneric*: NR cell re-selection

Derivation Path: TS 38.508-1 [14], Table 4.6.3-130			
Information Element	**Value/remark**	**Comment**	**Condition**
RACH-ConfigGeneric ::= SEQUENCE {			
prach-ConfigurationIndex	190		
}			

Table 7.1.1.5.4.3-2A: SIB1 (Cell 1 and Cell 2)

Derivation Path: Table H.2.2-3			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB1 ::= SEQUENCE {			
cellSelectionInfo SEQUENCE {			
q-RxLevMin	-70	Actual value is -62*2 = -140dBm	7.1.1.5-1 and Cell 1
	-68	Actual value is -62*2 = -136dBm	7.1.1.5-2 and Cell 1
	-62	Actual value is -62*2 = -124dBm	7.1.1.5-1 and Cell 2
	-60	Actual value is -62*2 = -120dBm	7.1.1.5-2 and Cell 2
}			
}			

Table 7.1.1.5.4.3-3: SIB2 (Cell 1 and Cell 2)

Derivation Path: Table H.2.2-1			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB2 ::= SEQUENCE {			
cellReselectionServingFreqInfo SEQUENCE {			
s-NonIntraSearchP	31	Actual value is 31*2 = 62dBm	Cell 2
threshServingLowP	31	Actual value is 31*2 = 62dBm	Cell 2
cellReselectionPriority	4		Cell 1
	5		Cell 2
}			
relaxedMeasurement-r16 SEQUENCE {			
lowMobilityEvaluation-r16 SEQUENCE {			
s-SearchDeltaP-r16	dB12		
t-SearchDeltaP-r16	s5		
}			
cellEdgeEvaluation-r16	Not present		
combineRelaxedMeasCondition-r16	Not present		
highPriorityMeasRelax-r16	Not present		
}			
}			

Table 7.1.1.5.4.3-4: SIB4 (Cell 1)

Derivation Path: Table H.2.2-2 with condition NR Cell 1, SMTC.1 and Synchronous cells			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB4 ::= SEQUENCE {			
interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo {	1 Entry		
InterFreqCarrierFreqInfo[1] SEQUENCE {		Entry 1	
q-RxLevMin	-70	Actual value = -70*2 = -140dBm	7.1.1.2-1
	-68	Actual value = -68*2 = -136dBm	7.1.1.2-2
threshX-HighP	16	Actual value is 16*2 = 32dBm	
}			
}			
}			

Table 7.1.1.5.4.3-5: SIB4 (Cell 2)

Derivation Path: Table H.2.2-2 with condition NR Cell 2, SMTC.1 and Synchronous cells			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB4 ::= SEQUENCE {			
interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo {	1 Entry		
InterFreqCarrierFreqInfo[1] SEQUENCE {		Entry 1	
q-RxLevMin	-62	Actual value = -62*2 = -124dBm	7.1.1.2-1
	-60	Actual value = -60*2 = -120dBm	7.1.1.2-2
threshX-LowP	9	Actual value = 9*2 = 18dBm	
}			
}			
}			

7.1.1.5.5 Test requirement

Tables 7.1.1.5.4.1-3 and 7.1.1.5.5-1 define the primary level settings including test tolerances for inter frequency NR cell re-selection test case for UE fulfilling low mobility relaxed measurement criterion.

Table 7.1.1.5.5-1: Cell specific test parameters for NR SA FR2-FR2 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

Parameter	Unit	Test configuration	Cell 1		Cell 2	
			T1	T2	T1	T2
TDD configuration		1, 2	TDDConf.3.1		TDDConf.3.1	
PDSCH RMC configuration		1, 2	SR.3.1 TDD		SR.3.1 TDD	
RMSI CORESET parameters		1, 2	CR.3.1 TDD		CR.3.1 TDD	
RMSI CORESET RMC configuration		1, 2	CCR.3.1 TDD		CCR.3.1 TDD	
OCNG Pattern		1, 2	OP.1 defined in A.3.2.1		OP.1 defined in A.3.2.1	
BWchannel	MHz	1, 2	100: NRB,c = 66		100: NRB,c = 66	
Data RBs allocated		1, 2	66		66	
Initial DL BWP configuration		1, 2	DLBWP.0.1		DLBWP.0.1	
Initial UL BWP configuration		1, 2	ULBWP.0.1		ULBWP.0.1	
RLM-RS		1, 2	SSB		SSB	
Qrxlevmin	dBm/SCS	1	-140		-124 [Note6]	
		2	-137		-121 [Note6]	
Pcompensation	dB	1, 2	0		0	
Qhyst$_s$	dB	1, 2	0		0	
Qoffset$_{s, n}$	dB	1, 2	0		0	
Cell_selection_and_reselection_quality_measurement		1, 2	SS-RSRP		SS-RSRP	
AoA setup		1, 2	Setup 1 defined in A.3.15.1		Setup 1 defined in A.3.15.1	
Beam assumption[Note 4]		1, 2	Rough		Rough	
$\hat{E}_s/I_{ot\,BB}$ [Note 5]	dB	1, 2	10.06	[87.56	-3.34-3	8.06[8]
N_{oc} [Note2]	dBm/SCS	1	-93		-93	
		2	-90		-90	

N_{oc} Note2	dBm/15 kHz	1, 2	-102		-102	
$\hat{E}_s / N_{oc}$	dB	1, 2	10.58	8	-2.9 Note6 -3	8.58
SS-RSRP Note3	dBm/SCS	1	-82.5 -85	-85 -85	-95.9 -96	-84.5 -85
		2	-79.5 -82	-82 -82	-92.9 -93	-81.5 -82
Io	dBm/95.04 MHz	1	-53.11-55.37	-55.34 -55.37	-62.18-62.25	-54.91-55.37
		2	-53.11-52.37	-55.34 -52.37	-62.18-59.25	-54.91-52.37
TreselectionNR	s	1, 2	0		0	
SnonintrasearchP	dB	1, 2	50		Not sent	
S$_{SearchDeltaP}$	dB	1, 2	12 Note6		12 Note6	
T$_{SearchDeltaP}$	s	1, 2	5		5	
Thresh$_{x, high}$	dB	1, 2	32 Note6		48	
Thresh$_{serving, low}$	dB	1, 2	44		62 Note6	
Thresh$_{x, low}$	dB	1, 2	50		18 Note6	
Propagation Condition		1, 2	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 levels have been derived from other parameters for information purposes. They are not settable parameters themselves.						
Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation						
Note 5: Calculation of Es/Iot$_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMB$_P$ from TS 38.101-2 [19] Table 6.2.1.3-4.						
Note 6: Including the test tolerance given in Annex F.						

The cell reselection delay to an already detected low priority cell (Cell 1) for UE fulfilling low mobility criterion 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 an already detected low priority cell, Cell 1, shall be less than 79 s.

The cell reselection delay to an already detected high priority cell (Cell 2) for UE fulfilling low mobility criterion 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 an already detected high priority cell, Cell 2, shall be less than 79 s.

> NOTE 1: The cell re-selection delay to an already detected low priority cell can be expressed as: $T_{evaluate, NR\_inter}$ + T_{SI-NR}

> NOTE 2: The cell re-selection delay to an already detected higher priority cell can be expressed as: $T_{evaluate, NR\_inter}$ + T_{SI-NR}

Where:

> $T_{evaluate, NR\_inter}$ as speciied in TS 38.133 Table 4.2.2.10.2-1 in clause 4.2.2.10.2

> 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 78.08 s, allow 79 s for the cell re-selection delay to an already detected low priority cell for UE fulfilling low mobility criterion in the test case.

This gives a total of 78.08 s, allow 79 s for the cell re-selection delay to an already detected high priority cell for UE fulfilling low mobility criterion in the test case.

For the test to pass, both events above shall pass.

The statistical pass/fail decisions are done separated for each event. For an event to pass, the total number of successful loops shall be more than 90% of the cases with a confidence level of 95%.

7.1.1.6   NR SA FR2-FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

Editor's Note: This test case is complete for the following configurations:

- Test frequency f ≤ 40.8 GHz.

- UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

7.1.1.6.1   Test purpose

The purpose of this test is to verify the requirement for the inter frequency NR cell reselection requirements when UE fulfils the not-at-cell edge relaxed measurement criterion specified in TS 38.133 clause 4.2.2.10.

7.1.1.6.2   Test applicability

This test applies to all types of NR UE from Release 16 onwards supporting relaxed RRM measurement.

7.1.1.6.3   Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.1.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.7.1.1.6.

7.1.1.6.4   Test description

7.1.1.6.4.1   Initial conditions

This test shall be run in one of the configurations defined in Table 7.1.1.6.4.1-1.

Table 7.1.1.6.4.1-1: Supported test configurations for NR SA FR2-FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

Configuration	Description
7.1.1.6-1	120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
7.1.1.6-2	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.

Configure the test equipment and the DUT according to the parameters in Table 7.1.1.6.4.1-2.

Table 7.1.1.6.4.1-2: Initial conditions for NR SA FR2-FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.1.1.6.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.6.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.2	

Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 7.1.1.6.4.1-3.

2. Message contents are defined in clause 7.1.1.6.4.3.

3. There is one NR carrier and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is the neighbour cell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

Table 7.1.1.6.4.1-3: General test parameters for NR SA FR2-FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2	Cell2	The UE camps on cell2 and fulfils not-at-cell edge (*cellEdgeEvaluation* [2]) criterion.
	Neighbour cell		1, 2	Cell1	
T1 final condition	Active cell		1, 2	Cell1	The UE reselects to low priority cell1 during T1
	Neighbour cell		1, 2	Cell2	
T2 final condition	Active cell		1, 2	Cell2	The UE reselects to high priority cell2 during T2
	Neighbour cell		1, 2	Cell1	
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	0.64	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	85	T1 needs to be long enough to allow cell re-selection to already known cell.
T2		s	1, 2	85	T2 needs to be long enough to allow cell re-selection to already known cell.

7.1.1.6.4.2   Test procedure

The test consists of one active cell and one neighbour cell. The UE is requested to monitor the neighbouring cell on one of the NR carriers. The test consists of two successive time periods, with time duration of T1, T2 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.

The UE is configured only not-at-cell edge criterion defined in clause 5.2.4.9.1 in TS 38.304 [30]. So, Cell 1 configures the UE as follows:

- *lowMobilityEvaluation* [2] is not configured;

- *cellEdgeEvaluation* [2] is configured according to the parameters listed in Table 7.1.1.6.5-1;

- *combineRelaxedMeasCondition* [2] is not configured

In the following test procedure "UE responds" means "UE starts transmitting preamble on PRACH for sending the RRC SETUP REQUEST message to perform a Registration procedure for mobility.

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

2. Set the parameters according to T1 in Table 7.1.1.6.5-1. T1 starts.

3. The SS waits for random access requests information from the UE to perform cell re-selection to Cell 1.

4. If the UE responds on lower priority Cell 1 during time duration T1 within 85 seconds from the beginning of time period T1, then count a success for the event "Re-select lower priority Cell 1". Otherwise count a fail for the event "Re-select lower priority Cell 1"

5. If the UE has re-selected Cell 1 within T1, after the re-selection or when T1 expires, continue with step 6. Otherwise, if T1 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 10.

5a The SS shall send an RRCConnectionRelease to ensure that the UE is in state RRC_IDLE.

6. The SS shall switch the power setting from T1 to T2 as specified in Table 7.1.1.6.5-1. T2 starts.

7. The SS waits for random access requests information from the UE to perform cell re-selection to an already detected cell, Cell 2.

8. If the UE responds to higher priority Cell 2 during time duration T2 within 85 seconds from the beginning of time period T2, then count a success for the event "Re-select higher priority Cell 2". Otherwise count a fail for the event "Re-select higher priority Cell 2"

9. If the UE has re-selected Cell 2 within T2, after the re-selection or when T2 expires, continue with step 10. Otherwise, if T2 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and continue with step 10.

10. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat step 2-10 until a test verdict has been achieved.
    Each of the events "Re-select lower priority Cell 1" and "Re-select higher priority Cell 2" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict.
    If both events pass, the test passes. If one event fails, the test fails.

7.1.1.6.4.3   Message contents

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

Table 7.1.1.6.4.3-1: Common Exception messages

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

Table 7.1.1.6.4.3-2: *RACH-ConfigGeneric*: NR cell re-selection

Derivation Path: TS 38.508-1 [14], Table 4.6.3-130			
Information Element	**Value/remark**	**Comment**	**Condition**
RACH-ConfigGeneric ::= SEQUENCE {			
prach-ConfigurationIndex	190		
}			

Table 7.1.1.6.4.3-2A: SIB1 (Cell 1 and Cell 2)

Derivation Path: Table H.2.2-3			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB1 ::= SEQUENCE {			
cellSelectionInfo SEQUENCE {			
q-RxLevMin	-70	Actual value is -62*2 = -140dBm	7.1.1.6-1 and Cell 1
	-68	Actual value is -62*2 = -136dBm	7.1.1.6-2 and Cell 1
	-62	Actual value is -62*2 = -124dBm	7.1.1.6-1 and Cell 2
	-60	Actual value is -62*2 = -120dBm	7.1.1.6-2 and Cell 2
}			
}			

Table 7.1.1.6.4.3-3: SIB2 (Cell 1 and Cell 2)

Derivation Path: Table H.2.2-1			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB2 ::= SEQUENCE {			
cellReselectionServingFreqInfo SEQUENCE {			
s-NonIntraSearchP	31	Actual value is 31*2 = 62dBm	Cell 2
threshServingLowP	31	Actual value is 31*2 = 62dBm	Cell 2
cellReselectionPriority	4		Cell 1
	5		Cell 2
}			
relaxedMeasurement-r16 SEQUENCE {			
lowMobilityEvaluation-r16	Not present		
cellEdgeEvaluation-r16 SEQUENCE {			
s-SearchThresholdP-r16	18	Actual value = 18*2 = 36dB	Cell 1
	6	Actual value = 6*2 = 12dB	Cell 2
}			
combineRelaxedMeasCondition-r16	Not present		
highPriorityMeasRelax-r16	Not present		
}			
}			

Table 7.1.1.6.4.3-4: SIB4 (Cell 1)

Derivation Path: Table H.2.2-2 with condition NR Cell 1, SMTC.1 and Synchronous cells			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB4 ::= SEQUENCE {			
interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo {	1 Entry		
InterFreqCarrierFreqInfo[1] SEQUENCE {		Entry 1	
q-RxLevMin	-70	Actual value = -70*2 = -140dBm	7.1.1.6-1
	-68	Actual value = -68*2 = -136dBm	7.1.1.6-2
threshX-HighP	16	Actual value is 16*2 = 32dBm	
}			
}			
}			

Table 7.1.1.6.4.3-5: SIB4 (Cell 2)

Information Element	Value/remark	Comment	Condition
Derivation Path: Table H.2.2-2 with condition NR Cell 2, SMTC.1 and Synchronous cells			
SIB4 ::= SEQUENCE {			
interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo {	1 Entry		
InterFreqCarrierFreqInfo[1] SEQUENCE {		Entry 1	
q-RxLevMin	-62	Actual value = -62*2 = -124dBm	7.1.1.6-1
	-60	Actual value = -60*2 = -120dBm	7.1.1.6-2
threshX-LowP	9	Actual value = 9*2 = 18dBm	
}			
}			
}			

7.1.1.6.5 Test requirement

Tables 7.1.1.6.4.1-3 and 7.1.1.6.5-1 define the primary level settings including test tolerances for inter frequency NR cell re-selection test case for UE fulfilling not-at-cell edge relaxed measurement criterion.

Table 7.1.1.6.5-1: Cell specific test parameters for NR SA FR2-FR2 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

Parameter	Unit	Test configuration	Cell 1		Cell 2	
			T1	T2	T1	T2
TDD configuration		1, 2	TDDConf.3.1		TDDConf.3.1	
PDSCH RMC configuration		1, 2	SR.3.1 TDD		SR.3.1 TDD	
RMSI CORESET parameters		1, 2	CR.3.1 TDD		CR.3.1 TDD	
RMSI CORESET RMC configuration		1, 2	CCR.3.1 TDD		CCR.3.1 TDD	
OCNG Pattern		1, 2	OP.1 defined in A.3.2.1		OP.1 defined in A.3.2.1	
BW$_{channel}$	MHz	1, 2	100: N$_{RB,c}$ = 66		100: N$_{RB,c}$ = 66	
Data RBs allocated		1, 2	66		66	
Initial DL BWP configuration		1, 2	DLBWP.0.1		DLBWP.0.1	
Initial UL BWP configuration		1, 2	ULBWP.0.1		ULBWP.0.1	
RLM-RS		1, 2	SSB		SSB	
Qrxlevmin	dBm/SCS	1	-140		-124 [Note 6]	
		2	-137		-121 [Note 6]	
Pcompensation	dB	1, 2	0		0	
Qhyst$_s$	dB	1, 2	0		0	
Qoffset$_{s, n}$	dB	1, 2	0		0	
Cell_selection_and_ reselection_quality_ measurement		1, 2	SS-RSRP		SS-RSRP	
AoA setup		1, 2	Setup 1 defined in A.3.15.1		Setup 1 defined in A.3.15.1	
Beam assumption[Note 4]		1, 2	Rough		Rough	
$\hat{E}_s/I_{ot\,BB}$ [Note 5]	dB	1, 2	10.06	7.56	-3.34	8.06
N_{oc} [Note2]	dBm/SCS	1	-93		-93	
		2	-90		-90	

N_{oc} Note2	dBm/15 kHz	1, 2	-102		-102	
$\hat{E}_s / N_{oc}$	dB	1, 2	10.5	8	-2.9 Note 6	8.5
SS-RSRP Note3	dBm/SCS	1	-82.5	-85	-95.9	-84.5
		2	-79.5	-82	-92.9	-81.5
Io	dBm/95.04 MHz	1	-53.11	-55.34	-62.18	-54.91
		2	-53.11	-55.34	-62.18	-54.91
$S_{SearchThresholdP}$		1, 2	35	35	12 Note 6	12 Note 6
TreselectionNR	s	1, 2	0		0	
SnonintrasearchP	dB	1, 2	50		Not sent	
Thresh$_{x, high}$	dB	1, 2	32 Note 6		48	
Thresh$_{serving, low}$	dB	1, 2	44		62 Note 6	
Thresh$_{x, low}$	dB	1, 2	50		18 Note 6	
Propagation Condition		1, 2	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 levels have been derived from other parameters for information purposes. They are not settable parameters themselves.					
Note 4:	Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation					
Note 5:	Calculation of Es/Iot$_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMB$_P$ from TS 38.101-2 [19] Table 6.2.1.3-4.					
Note 6:	Including the test tolerance given in Annex F.					

The cell reselection delay to an already detected low priority cell (Cell 1) for UE fulfilling not-at-cell edge criterion 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 an already detected low priority cell, Cell 1, shall be less than 79 s.

The cell reselection delay to an already detected high priority cell (Cell 2) for UE fulfilling not-at-cell edge criterion 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 an already detected high priority cell, Cell 2, shall be less than 79 s.

NOTE 1: The cell re-selection delay to an already detected low priority cell can be expressed as: $T_{evaluate, NR\_inter}$ + T_{SI-NR}

NOTE 2: The cell re-selection delay to an already detected higher priority cell can be expressed as: $T_{evaluate, NR\_inter}$ + T_{SI-NR}

Where:

$T_{evaluate, NR\_inter}$ as speciied in TS 38.133 Table 4.2.2.10.2-1 in clause 4.2.2.10.2

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 78.08 s, allow 79 s for the cell re-selection delay to an already detected low priority cell for UE fulfilling not-at-cell edge criterion in the test case.

This gives a total of 78.08 s, allow 79 s for the cell re-selection delay to an already detected high priority cell for UE fulfilling not-at-cell edge criterion in the test case.

For the test to pass, both events above shall pass.

The statistical pass/fail decisions are done separated for each event. For an event to pass, the total number of successful loops shall be more than 90% of the cases with a confidence level of 95%.

7.2   RRC_INACTIVE state mobility

7.3   RRC_CONNECTED state mobility

7.3.1   Handover

7.3.1.4   NR SA FR1-FR2 synchronous DAPS handover

Editor's Note:

-    This test cases is incomplete since FR1-FR2 OTA testability is still FFS.

-    MU and TT analysis is complete for UE PC3 and test frequenc f ≤ 40.8 GHz.

-    MU and TT analysis is incomplete for test frequency f > 40.8 GHz

MU and TT analysis is incomplete for UE power class other than PC3.7.3.1.4.1   Test purpose

To verify the requirement for the NR FR1-NR FR2 inter-band inter-frequency synchronous DAPS handover requirements in synchronous scenario specified in 38.133 [6] clause 6.1.3.4.

7.3.1.4.2   Test applicability

This test applies to all types of NR UE from Release 16 onwards and support inter-frequency DAPS handover.

7.3.1.4.3   Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.3.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.1.4.

7.3.1.4.4   Test description

7.3.1.4.4.1   Initial conditions

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

This test shall be tested using any of the test configurations in Table 7.3.1.4.4.1-1.

Table 7.3.1.4.4.1-1: NR SA FR1-FR2 synchronous DAPS handover test configurations

Config	Description
7.3.1.4-1	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
7.3.1.4-2	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
7.3.1.4-3	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 only required to be tested in one of the supported test configurations

Configure the test equipment and the DUT according to the parameters in Table 7.3.1.4.4.1-2

Table 7.3.1.4.4.1-2: Initial conditions for NR SA FR1-FR2 synchronous DAPS handover

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.1, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.3.1.4.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1-1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 7.3.1.4.4.3.

2. The power levels and settings for NR FR1 Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR2 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.

3. The test parameters are given in Table 7.3.1.4.4.1-3 below, with A4-Threshold modified by Test Tolerance.

Table 7.3.1.4.4.1-3: General test parameters for NR SA FR1-FR2 synchronous DAPS handover

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
A4-Threshold		dBm	-120	
Hysteresis		dB	0	
Time To Trigger		s	0	
Filter coefficient			0	L3 filtering is not used
Access Barring Information		-	Not Sent	No additional delays in random access procedure.
Time offset between cells		μs	33	Synchronous cells
T1		s	5	
T2		s	<5	
T3		s	<0.5	
T4		ms	$10+T_{interrupt2}$	$T_{interrupt2}$ as defined in 38.133 [6] Table 6.1.3.4.2-2 for synchronous DAPS HO
T5		ms	100	

7.3.1.4.4.2   Test procedure

The test scenario comprises of two NR carriers each with one cell. NR Cell 1 is the source PCell on a FR1 carrier and NR Cell 2 is the target PCell on a FR2 carrier. General parameters for Cell 1 and Cell 2 are given in Table 7.3.1.4.4.1-3 and Table 7.3.1.4.4.1-4 respectively.

The test consists of five successive time periods, with time durations of T1, T2, T3, T4 and T5 respectively.

Before the start of T1, the UE is connected to the Cell 1 and not aware of the Cell 2. During T1, the UE does not have any timing information of the Cell 2.

Before the start of T2, the UE is configured with event A4 triggered measurement reporting on target carrier and measurement gaps (gap pattern ID # 0). From start of T2, the Cell 2 becomes detectable. The UE performs cell detection and measurements on the Cell 2 and shall send event report to the network. After receiving the event report A4, the network sends a RRC message implying DAPS handover command for target cell addition to the UE.

T3 starts from the instant when the test system receives the ACK of the PDSCH corresponding to the last TTI containing DAPS handover command for target cell addition sent to the UE. During T3, UE shall be able to perform random access, DL schedule and UL feedback to cell 1 shall be avoided when UE is required to perform DL reception or UL transmission in PRACH procedure in cell 2, except preamble transmission. After successful RACH procedure on the Cell 2, UE is scheduled with PDSCH from Cell 1 and Cell 2 in alternative TTIs. In the end of T3 the network sends

a RRC message implying DAPS handover command for source cell release to the UE. During T3, the handover delay $D_{handover1}$ for target cell addition need to be verified.

T4 starts from the instant when the test system receives the ACK of the PDSCH corresponding to the last TTI containing DAPS handover command for source cell release sent to the UE. During T4, the UE shall accomplish the release actions within $D_{handover2}$

From start of T5, the UE shall stop sending periodical CSI report on Cell 1.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 7.3.1.4.5-1 and Table 7.3.1.4.5-2 respectively. Propagation conditions are set according to Annex C clause C.2.2. T1 starts and the SS starts continuously scheduling the UE to perform DL reception in every DL slot on Cell 1 and monitoring corresponding ACK/NACK feedbacks sent by the UE.

3. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2).

4. The SS shall transmit an *RRCReconfiguration* message to configure event A4 triggered measurement reporting on the inter-frequency carrier and periodical CSI reporting on Cell 1.

5. The UE shall transmit an *RRCReconfigurationComplete* message.

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.3.1.4.5-1 and Table 7.3.1.4.5-2 respectively.

7. UE shall transmit a *MeasurementReport* message triggered by Event A4.

8. SS shall transmit an *RRCReconfiguration* with *reconfigurationWithSync* message which reconfiguring DRB as a DAPS radio bearer to the UE, at that instant the SS receives the ACK of the PDSCH corresponding to the *RRCReconfiguration* with *reconfigurationWithSync* message the SS shall switch the power settings from T2 to T3 as specified in Table 7.3.1.4.5-1 and Table 7.3.1.4.5-2. T3 starts and the SS stops scheduling the UE to perform DL reception on Cell 1.

9. If the UE transmits PRACH preamble to Cell 2 within $D_{handover1}$ from the beginning of time period T3 then the number of successful tests is increased by one, continue to step 10. Otherwise, the number of failure tests is increased by one, go to step 17. where:

   - $D_{handover1}$ = 92 ms.

10. The UE transmits an *RRCReconfigurationComplete* message on Cell 2.

11. Upon receiving *RRCReconfigurationComplete* message sent by UE, the SS immediately starts scheduling UE to perform DL reception in Cell 1 and Cell 2 in an alternative manner, and monitoring corresponding ACK/NACK feedbacks sent by the UE.

12. Upon T3 expiring, the SS immediately transmit an *RRCReconfiguration* with *daps-SourceRelease-r16 = true* on Cell 2 to the UE. T4 starts when the SS receives the ACK of the PDSCH corresponding to the *RRCReconfiguration* with *daps-SourceRelease-r16 = true*.

13. The UE transmits an *RRCReconfigurationComplete* message on Cell 2.

14. When T4 expires, T5 starts.

15. If

    a) The UE can report ACK/NACK from the first DL reception scheduled on Cell 2 after the beginning of time period T5,

    and

    b) The UE doesn't send periodical CSI report during entire time period T5.

then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

16. After T5 expires, the SS sends an *RRCReconfiguration* with *reconfigurationWithSync* to cause UE handover back to Cell 1.

17. If UE is not in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1, switch off and on the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1.

18. Repeat steps 2-17 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

7.3.1.4.4.3   Message contents

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

Table 7.3.1.4.4.3-1: RRCReconfiguration (Step 4)

Information Element	Value/remark	Comment	Condition
Derivation Path: TS 38.508-1 [14], 4.6.1-13 with condition NR_MEAS			
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration SEQUENCE {			
measConfig	MeasConfig	Table 7.3.1.4.4.3-3	
nonCriticalExtension SEQUENCE {			
masterCellGroup SEQUENCE {			
spCellConfigDedicated	ServingCellConfig	Table 7.3.1.4.4.3-2	
}			
}			
}			
}			
}			

Table 7.3.1.4.4.3-2: ServingCellConfig (Table 7.3.1.4.4.3-1)

Information Element	Value/remark	Comment	Condition
Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS			
ServingCellConfig ::= SEQUENCE {			
csi-MeasConfig	CSI-MeasConfig for RRM Specified in TS 38.508-1 [14] Table 7.3.1-6		
}			

Table 7.3.1.4.4.3-3: MeasConfig (Table 7.3.1.4.4.3-1)

Information Element	Value/Remark	Comment	Condition
Derivation path: Table H.3.1-2 with condition INTER-FREQ			
measConfig ::= SEQUENCE {			
reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE {	1 entry		
reportConfig[1] CHOICE {			
reportConfigNR	ReportConfigNR(-120) specified in Table H.3.1-4AA	Acutal value of A4-threshold is -120dBm	
}			
}			
}			

Table 7.3.1.4.4.3-4: MeasurementReport (Step 7)

Information Element	Value/remark	Comment	Condition
Derivation Path: TS 38.508-1 [14], Table 4.6.1-5A			
MeasurementReport ::= SEQUENCE {			
criticalExtensions CHOICE {			
measurementReport SEQUENCE {			
measResults	MeasResults specified in Table H.3.1-7 with condition INTER-FREQ		
}			
}			
}			

Table 7.3.1.4.4.3-5: RRCReconfiguration (Step 8)

Information Element	Value/remark	Comment	Condition
Derivation Path: TS 38.508-1 [4], Table 4.8.1-1A with Condition RBConfig_NoKeyChange			
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration SEQUENCE {			
radioBearerConfig	RadioBearerConfig	Table 7.3.1.4.4.3-6	
nonCriticalExtension SEQUENCE{			
masterCellGroup	CellGroupConfig	Table 7.3.1.4.4.3-7	
}			
}			
}			
}			

Table 7.3.1.4.4.3-6: RadioBearerConfig (Table 7.3.1.4.4.3-5)

Information Element	Value/remark	Comment	Condition
Derivation Path: TS 38.508-1 [14], Table 4.6.3-132 with condition DRB1			
RadioBearerConfig ::= SEQUENCE {			
drb-ToAddModList SEQUENCE (SIZE (1..maxDRB)) OF DRB-ToAddMod {	1 entry		
DRB-ToAddMod[1] SEQUENCE {		entry 1	
drb-Identity	DRB-Identity using condition DRBn	DRB #n is a DRB established before DAPS HO. Actual value of n is left to TE implementation	
daps-Config-r16	true		
}			
}			
securityConfig	Not present		
}			

Table 7.3.1.4.4.3-7: CellGroupConfig (Table 7.3.1.4.4.3-6)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition PCell_change			
Information Element	**Value/remark**	**Comment**	**Condition**
CellGroupConfig ::= SEQUENCE {			
rlc-BearerToAddModList	Not present		
spCellConfig SEQUENCE {			
reconfigurationWithSync SEQUENCE {			
spCellConfigCommon SEQUENCE {			
physCellId	PhysCellId for Cell 2		
}			
}			
}			
}			

Table 7.3.1.4.4.3-8: RRCReconfiguration (Step 12)

Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition DAPS_HO_ReleaseSource

7.3.1.4.5   Test requirements

Table 7.3.1.4.5-1 and Table 7.3.1.4.5-2 defines the primary level settings including test tolerances for all tests.

Table 7.3.1.4.5-1: Cell specific test parameters for NR SA FR1-FR2 synchronous DAPS handover (Cell 1 in FR1)

Parameter		Unit	Cell 1				
			T1	T2	T3	T4	T5
NR 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				
BW$_{channel}$	Config 1	MHz	10: N$_{RB,c}$ = 52				
	Config 2		10: N$_{RB,c}$ = 52				
	Config 3		40: N$_{RB,c}$ = 106				
BWP BW	Config 1	MHz	10: N$_{RB,c}$ = 52				
	Config 2		10: N$_{RB,c}$ = 52				
	Config 3		40: N$_{RB,c}$ = 106				
TRS configuration	Config 1		TRS.1.1 FDD				
	Config 2		TRS.1.1 TDD				
	Config 3		TRS.1.2 TDD				
DRx Cycle		ms	Not Applicable				
PDSCH Reference measurement channel	Config 1		SR.1.1 FDD				
	Config 2		SR.1.1 TDD				
	Config 3		SR2.1 TDD				
CORESET Reference Channel	Config 1		CR.1.1 FDD				
	Config 2		CR.1.1 TDD				
	Config 3		CR2.1 TDD				
OCNG Patterns			OP.1				
CSI-RS configuration for CSI reporting	Config 1		CSI-RS.1.1 FDD				
	Config 2		CSI-RS.1.1 TDD				
	Config 3		CSI-RS.2.1 TDD				
reportConfigType			periodic				
reportQuantity			cri-RI-PMI-CQI				
CSI reporting periodicity	Config 1,2	slot	5				
	Config 3		10				
CSI reporting offset	Config 1,2	slot	3				
	Config 3		5				
SSB Configuration	Config 1,2		SSB.1 FR1				
	Config 3		SSB.2 FR1				
SMTC Configuration	Config 1,2		SMTC.1				
	Config 3		SMTC.2				
PDSCH/PDCCH subcarrier spacing	Config 1,2	kHz	15 kHz				
	Config 3		30 kHz				
PUCCH/PUSCH subcarrier spacing	Config 1,2	kHz	15 kHz				
	Config 3		30 kHz				
PRACH configuration			FR1 PRACH configuration 2				
BWP	Initial DL BWP		DLBWP.0.1				
	Dedicated DL BWP		DLBWP.1.3				
	Initial UL BWP		ULBWP.0.1				
	Dedicated UL BWP		ULBWP.1.3				
EPRE ratio of PSS to SSS		dB	0				
EPRE ratio of PBCH DMRS to SSS							
EPRE ratio of PBCH to PBCH DMRS							
EPRE ratio of PDCCH DMRS to SSS							
EPRE ratio of PDCCH to PDCCH DMRS							
EPRE ratio of PDSCH DMRS to SSS							
EPRE ratio of PDSCH to PDSCH							
EPRE ratio of OCNG DMRS to SSS(Note 1)							
EPRE ratio of OCNG to OCNG DMRS (Note 1)							
N_{oc} Note2		dBm/15kHz	NA Link only, see clause A.3.7A				
N_{oc} Note2	Config 1,2	dBm/SCS					
	Config 3						

$\hat{E}_s/I_{ot}$		dB	
$\hat{E}_s/N_{oc}$		dB	
Io[Note3]	Config 1,2	dBm/ 9.36MHz	
	Config 3	dBm/ 38.16MHz	
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: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.			
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.			

Table 7.3.1.4.5-2: Cell specific test parameters for NR SA FR1-FR2 synchronous DAPS handover (Cell 2 in FR2)

Parameter		Unit	Cell 2	
			T1	T2 - T5
Assumption for UE beams[Note 6]			Rough	
AoA setup			Setup 1 as defined in A.3.15	
NR RF Channel Number			2	
Duplex mode	Config 1,2,3		TDD	
TDD configuration	Config 1,2,3		TDDConf.3.1	
$BW_{channel}$	Config 1,2,3	MHz	100: $N_{RB,c} = 66$	
BWP BW	Config 1,2,3	MHz	100: $N_{RB,c} = 66$	
TRS configuration	Config 1,2,3		TRS.2.1 TDD	
DRX Cycle		ms	Not Applicable	
PDSCH Reference measurement channel	Config 1,2,3		SR3.1 TDD	
CORESET Reference Channel	Config 1,2,3		CR3.1 TDD	
OCNG Patterns			OCNG pattern 1	
SSB Configuration	Config 1,2,3		SSB.1 FR2	
CSI-RS configuration for CSI reporting	Config 1,2,3		CSI-RS.3.1 TDD	
SMTC Configuration			SMTC.1	
PDSCH/PDCCH subcarrier spacing	Config 1,2,3	kHz	120 kHz	
PUCCH/PUSCH subcarrier spacing	Config 1,2,3	kHz	120 kHz	
PRACH configuration			FR2 PRACH configuration 2	
TCI configuration			CSI-RS.Config.0	
BWP	Initial DL BWP		DLBWP.0.1	
	Dedicated DL BWP		DLBWP.1.3	
	Initial UL BWP		ULBWP.0.1	
	Dedicated UL BWP		ULBWP.1.3	
EPRE ratio of PSS to SSS		dB	0	
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS(Note 1)				
EPRE ratio of OCNG to OCNG DMRS (Note 1)				
N_{oc} [Note2]		dBm/15kHz	-104.7	-104.7
N_{oc} [Note2]		dBm/SCS	-95.7	-95.7
$\hat{E}_s / I_{ot}$		dB	-Infinity	10
$\hat{E}_s / N_{oc}$		dB	-Infinity	10
Io[Note3]		dBm/ 95.04MHz	-66.7	-55.4
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: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.				
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.				
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: Information about types of UE beam is given in 38.133 [6] B.2.1.3, and does not limit UE implementation or test system implementation.				

The UE shall start to transmit the PRACH to Cell 2 less than $D_{handover1}$ from the beginning of time period T3. The interruption on Cell 1 shall not exceed $T_{interrupt1}$ as defined in TS 38.133 [6] Table 6.1.3.4.2-1 for synchronous DAPS HO. The rate of correct handovers observed during repeated tests shall be at least 90%, where:

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

- $T_{RRC\_procedure} = 10$ ms, is the RRC procedure delay specified in 38.331 [13] clause 12;

- $T_{search} = 0$ ms for known target cell, is the the time required to search the target cell specified in 38.133 [6] clause 6.1.1.2.2;

- $T_{IU} = 20$ ms, is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell specified in 38.133 [6] clause 6.1.1.2.2.

- $T_{processing} = 40$ ms, is the time for UE processing specified in 38.133 [6] clause 6.1.1.2.2.

- $T_\Delta = 20$ ms, is the time for fine time tracking and acquiring full timing information of the target cell specified in 38.133 [6] clause 6.1.1.2.2.

- $T_{margin} = 2$ ms, is the time for SSB post-processing specified in 38.133 [6] clause 6.1.1.2.2.

This gives a total of 92 ms.

After successful RACH to cell 2 and until the start of time period T4, UE shall be able to receive PDSCH alternatively from Cell 1 and Cell 2. UE is not expected to transmit UL to both cell 1 and cell 2 in the same TTI.

The UE shall release Cell 1 less than $D_{handover2}$ from the beginning of time period T4, where:

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

- $T_{RRC\_procedure} = 10$ ms, is the RRC procedure delay specified in 38.331 [13] clause 12;

- $T_{interrupt2} = 1.125$ ms for sync intra-frequency DAPS handover, is the allowed interruption length during $D_{handover2}$ as in 38.133 [13] clause 6.1.1.2.2;

This gives a total of 11.125 ms.

UE shall not report CSI to Cell 1 during T5.

7.3.1.5 NR SA FR1-FR2 asynchronous DAPS handover

Editor's Note:

- This test cases is incomplete since FR1-FR2 OTA testability is still FFS.

- MU and TT analysis is complete for UE PC3 and test frequenc f ≤ 40.8 GHz.

- MU and TT analysis is incomplete for test frequency f > 40.8 GHz

- MU and TT analysis is incomplete for UE power class other than PC3.

7.3.1.5.1 Test purpose

To verify the requirement for the NR FR1-NR FR2 inter-band inter-frequency asynchronous DAPS handover requirements in synchronous scenario specified in 38.133 [6] clause 6.1.3.4.

7.3.1.5.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and supporting inter-frequency asynchronous DAPS handover and supporting different SCSs in source PCell and inter-frequency target PCell in DAPS handover.

7.3.1.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.3.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.1.5.

7.3.1.5.4 Test description

7.3.1.5.4.1 Initial conditions

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

This test shall be tested using any of the test configurations in Table 7.3.1.5.4.1-1.

Table 7.3.1.5.4.1-1: NR SA FR1-FR2 asynchronous DAPS handover test configurations

Config	Description
7.3.1.5-1	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
7.3.1.5-2	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
7.3.1.5-3	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 only required to be tested in one of the supported test configurations

Configure the test equipment and the DUT according to the parameters in Table 7.3.1.5.4.1-2

Table 7.3.1.5.4.1-2: Initial conditions for NR SA FR1-FR2 asynchronous DAPS handover

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.1, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.3.1.5.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1-1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 7.3.1.5.4.3.

2. The power levels and settings for NR FR1 Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR2 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.

3. The test parameters are given in Table 7.3.1.5.4.1-3 below, with A4-Threshold modified by Test Tolerance.

Table 7.3.1.5.4.1-3: General test parameters for NR SA FR1-FR2 asynchronous DAPS handover

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
A4-Threshold		dBm	-120	
Hysteresis		dB	0	
Time To Trigger		s	0	
Filter coefficient			0	L3 filtering is not used
Access Barring Information		-	Not Sent	No additional delays in random access procedure.
Time offset between cells		μs	62.5	Asynchronous cells
T1		s	5	
T2		s	<5	
T3		s	<0.5	
T4		ms	10+$T_{interrupt2}$	$T_{interrupt2}$ as defined in Table 6.1.3.4.2-2 for asynchronous DAPS HO.
T5		ms	100	

7.3.1.5.4.2   Test procedure

Same test procedure as described in clause 7.3.1.4.4.2.

7.3.1.5.4.3   Message contents

Same message contents as described in clause 7.3.1.4.4.3.

7.3.1.5.5   Test requirements

Table 7.3.1.5.5-1 and Table 7.3.1.5.5-2 defines the primary level settings including test tolerances for all tests.

Table 7.3.1.5.5-1: Cell specific test parameters for NR SA FR1-FR2 asynchronous DAPS handover (Cell 1 in FR1)

Parameter		Unit	Cell 1	
			T1	T2 - T5
NR 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	
BW$_{channel}$	Config 1	MHz	10: N$_{RB,c}$ = 52	
	Config 2		10: N$_{RB,c}$ = 52	
	Config 3		40: N$_{RB,c}$ = 106	
BWP BW	Config 1	MHz	10: N$_{RB,c}$ = 52	
	Config 2		10: N$_{RB,c}$ = 52	
	Config 3		40: N$_{RB,c}$ = 106	
TRS configuration	Config 1		TRS.1.1 FDD	
	Config 2		TRS.1.1 TDD	
	Config 3		TRS.1.2 TDD	
DRX Cycle		ms	Not Applicable	
PDSCH Reference measurement channel	Config 1		SR.1.1 FDD	
	Config 2		SR.1.1 TDD	
	Config 3		SR.2.1 TDD	
CORESET Reference Channel	Config 1		CR.1.1 FDD	
	Config 2		CR.1.1 TDD	
	Config 3		CR.2.1 TDD	
OCNG Patterns			OP.1	
CSI-RS configuration for CSI reporting	Config 1		CSI-RS.1.1 FDD	
	Config 2		CSI-RS.1.1 TDD	
	Config 3		CSI-RS.2.1 TDD	
reportConfigType			periodic	
reportQuantity			cri-RI-PMI-CQI	
CSI reporting periodicity	Config 1,2	slot	5	
	Config 3		10	
CSI reporting offset	Config 1,2	slot	3	
	Config 3		5	
SSB Configuration	Config 1,2		SSB.1 FR1	
	Config 3		SSB.2 FR1	
SMTC Configuration	Config 1,2		SMTC.1	
	Config 3		SMTC.2	
PDSCH/PDCCH subcarrier spacing	Config 1,2	kHz	15 kHz	
	Config 3		30 kHz	
PUCCH/PUSCH subcarrier spacing	Config 1,2	kHz	15 kHz	
	Config 3		30 kHz	
PRACH configuration			FR1 PRACH configuration 2	
BWP	Initial DL BWP		DLBWP.0.1	
	Dedicated DL BWP		DLBWP.1.3	
	Initial UL BWP		ULBWP.0.1	
	Dedicated UL BWP		ULBWP.1.3	
EPRE ratio of PSS to SSS		dB	0	
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS [Note 1]				
EPRE ratio of OCNG to OCNG DMRS [Note 1]				
N_{oc} [Note2]		dBm/15kHz	NA Link only, see clause A.3.7A	
N_{oc} [Note2]	Config 1,2	dBm/SCS		

	Config 3		
$\hat{E}_s/I_{ot}$		dB	
$\hat{E}_s/N_{oc}$		dB	
Io[Note3]	Config 1,2	dBm/ 9.36MHz	
	Config 3	dBm/ 38.16MHz	
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: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.			
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.			

Table 7.3.1.5.5-2: Cell specific test parameters for NR SA FR1-FR2 asynchronous DAPS handover (Cell 2 in FR2)

Parameter	Unit	Cell 2	
		T1	**T2 - T5**

Assumption for UE beams[Note 6]			Rough	
AoA setup			Setup 1 as defined in A.3.15	
NR RF Channel Number			2	
Duplex mode	Config 1,2,3		TDD	
TDD configuration	Config 1,2,3		TDDConf.3.1	
BW$_{channel}$	Config 1,2,3	MHz	100: $N_{RB,c}$ = 66	
BWP BW	Config 1,2,3	MHz	100: $N_{RB,c}$ = 66	
TRS configuration	Config 1,2,3		TRS.2.1 TDD	
DRX Cycle		ms	Not Applicable	
PDSCH Reference measurement channel	Config 1,2,3		SR.3.1 TDD	
CORESET Reference Channel	Config 1,2,3		CR.3.1 TDD	
OCNG Patterns			OP.1	
CSI-RS configuration for CSI reporting	Config 1,2,3		CSI-RS.3.1 TDD	
SSB Configuration	Config 1,2,3		SSB.1 FR2	
SMTC Configuration			SMTC.1	
PDSCH/PDCCH subcarrier spacing	Config 1,2,3	kHz	120 kHz	
PUCCH/PUSCH subcarrier spacing	Config 1,2,3	kHz	120 kHz	
PRACH configuration			FR2 PRACH configuration 2	
TCI configuration			CSI-RS.Config.0	
BWP	Initial DL BWP		DLBWP.0.1	
	Dedicated DL BWP		DLBWP.1.3	
	Initial UL BWP		ULBWP.0.1	
	Dedicated UL BWP		ULBWP.1.3	
EPRE ratio of PSS to SSS		dB	0	
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS [Note 1]				
EPRE ratio of OCNG to OCNG DMRS [Note 1]				
N_{oc} [Note2]		dBm/15kHz	-104.7	-104.7
N_{oc} [Note2]		dBm/SCS	-95.7	-95.7
$\hat{E}_s/I_{ot}$		dB	-Infinity	10
$\hat{E}_s/N_{oc}$		dB	-Infinity	10
Io[Note3]		dBm/ 95.04MHz	-66.7	-55.4
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: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.				
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.				
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: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.				

Same Test requirements as described in clause 7.3.1.4.5.

7.3.2 RRC connection mobility control

7.3.2.1 RRC re-establishment

7.3.2.1.0 Minimum conformance requirements

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

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

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 ($T_{UE\_re\text{-}establish\_delay}$) 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 ($T_{UE\_re\text{-}establish\_delay}$) requirement shall be less than:

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

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

- SS-RSRP related side conditions given in Section 10.1.2 and 10.1.3 are fulfilled for a corresponding NR Band for FR1 and FR2, respectively,

- 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 Section 10.1.4 and 10.1.5 are fulfilled for a corresponding NR Band for FR1 and FR2, respectively,

- the conditions of SSB_RP and SSB Ês/Iot according to Annex B.2.2 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.

$T_{identify\_inter\_NR,i}$: 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. $T_{identify\_inter\_NR,i}$ 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] signalling 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.

$T_{SI\text{-}NR}$ = 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_{PRACH} = It is the delay uncertainty in acquiring the first available PRACH occasion in the target NR cell. T_{PRACH} 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.

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

Serving cell SSB Ês/Iot (dB)	Frequency range (FR) of target NR cell	$T_{identify\_intra\_NR}$ (ms)	
		Known NR cell	Unknown NR cell
≥ -8	FR1	MAX (200 ms, 5 x T_{SMTC})	MAX (800 ms, 10 x T_{SMTC})
≥ -8	FR2	N/A	MAX (1000 ms, 80 x T_{SMTC}))
< -8	FR1	N/A	800[Note1]
< -8	FR2	N/A	3520[Note1]
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 Ês/Iot < [-8] dB.		

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

Serving cell SSB Ês/Iot (dB)	Frequency range (FR) of target NR cell	$T_{identify\_inter\_NR, i}$ (ms)	
		Known NR cell	Unknown NR cell
≥ -8	FR1	MAX (200 ms, 6 x $T_{SMTC, i}$)	MAX (800 ms, 13 x $T_{SMTC, i}$)
≥ -8	FR2	N/A	MAX (1000 ms, 104 x $T_{SMTC, i}$))
< -8	FR1	N/A	800[Note1]
< -8	FR2	N/A	4000[Note1]
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 Ês/Iot < -8 dB.		

The normative reference for this requirement is TS 38.133 [6] clause 6.2.1.

7.3.2.1.1 NR SA FR2 RRC re-establishment

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

7.3.2.1.1.1 Test purpose

The purpose of this test is to verify that the NR intra-frequency RRC re-establishment delay in FR2 without known target cell is within the specified limits.

7.3.2.1.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.3.2.1.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.3.2.1.0

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.2.1.1

7.3.2.1.1.4 Test description

7.3.2.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.3.2.1.1.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 7.3.2.1.1.4.1-2. Test environment parameters are given in Table 7.3.2.1.1.4.1-3.

Table 7.3.2.1.1.4.1-1: Intra-frequency RRC re-establishment in FR2 supported test configurations

Config	Description
1	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 depending on UE capability

Table 7.3.2.1.1.4.1-2: General test parameters for Intra-frequency RRC re-establishment in FR2

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1	Cell1	
	Neighbour cells		1	Cell2	
Final condition	Active cell		1	Cell2	
RF Channel Number			1	1	
Time offset 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 Barring Information		-	1	Not Sent	No additional delays in random access procedure.
SSB configuration			1	SSB.1 FR2	
SMTC configuration			1	SMTC.1	
DRX cycle length		s	1	OFF	
PRACH configuration			1	PRACH.1 FR2	As specified in Annex A.7
T1		s	1	5	
T2		s	1	4.84	Time for the UE to detect RLF (Summation of $T_{Evaluate\_out\_SSB}$ defined in clause 8.1 in TS 38.133, T310 and the period for UE turns off transmitter defined in clause 8.1.5 in TS 38.133)
T3		s	1	5	

Table 7.3.2.1.1.4.1-3: Test Environment Intra-frequency RRC re-establishment in FR2

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5.1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2		
Channel bandwidth	As specified by the test configuration selected from Table 7.3.2.1.1.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram			

1. Message contents are defined in clause 7.3.2.1.1.4.3.

2. There is one NR carrier and two cells specified in the test. Cell 1 is the cell used for registration with the power level set according to Annex C.1.1 and C.1.2 for this test.

3. The AoA setup for this test is Setup 1 as defined in clause A.9

7.3.2.1.1.4.2 Test procedure

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.

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

2. Set the parameters according to T1 in Table 7.3.2.1.1.5-1. T1 starts.

3. SS shall transmit an RRCReconfiguration message.

4. The UE shall transmit RRCReconfigurationComplete message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.3.2.1.1.5-1. T2 starts

6. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 7.3.2.1.1.5-1. T3 starts

7. If the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2 within 3 s from the beginning of time period T3, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

8. After T3 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

9. Set cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

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

7.3.2.1.1.4.3 Message contents

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

Table 7.3.2.1.1.4.3-1: Common Exception messages for NR intra-frequency RRC re-establishment test case in FR2

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

Table 7.3.2.1.1.4.3-2: *RLF-TimersAndConstants* for intra-frequency RRC re-establishment

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	**Value/remark**	**Comment**	**Condition**
RLF-TimersAndConstants ::= SEQUENCE {			
t310	ms0		
t311	ms5000		
}			

Table 7.3.2.1.1.4.3-3: *MeasConfig* for intra-frequency RRC re-establishment

Derivation Path: TS 38.508-1 [14], Table 4.6.3-69			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasConfig::= SEQUENCE {			
reportConfigToAddModList	Not present		
measIdToAddModList	Not present		
quantityConfig	Not present		
}			

7.3.2.1.1.5 Test requirement

Table 7.3.2.1.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.3.2.1.1.5-1: Cell specific test parameters for NR intra-frequency RRC re-establishment test case in FR2

Parameter	Unit	Test configuration	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
Assumption for UE beams[Note 4]			Rough			Rough		
TDD configuration		1	TDDConf.3.1			TDDConf.3.1		
BW$_{channel}$	MHz	1	100: N$_{RB,c}$ = 66			100: N$_{RB,c}$ = 66		
Data RBs allocated		1	66			66		
PDSCH RMC configuration		1	SR.3.1 TDD			N/A		
RMSI CORESET RMC configuration		1	CR.3.1 FDD			CR.3.1 FDD		
Dedicated CORESET RMC configuration		1	CCR.3.1 FDD			CCR.3.1 FDD		
TRS configuration		1	TRS.2.1 TDD			N/A		
PDSCH/PDCCH TCI state		1	TCI.State.2			N/A		
OCNG Pattern		1	OP.1			OP.1		
Initial DL BWP configuration		1	DLBWP.0.1			DLBWP.0.1		
Initial UL BWP configuration		1	ULBWP.0.1			ULBWP.0.1		
RLM-RS		1	SSB			SSB		
AoA setup		1	Setup 1			Setup 1		
$\hat{E}_s / I_{ot}$	dB	1	-0.12	-infinity	-infinity	-3.46	2	2
N_{oc} [Note2]	dBm/SCS	1	-104.7					
N_{oc} [Note2]	dBm/15 kHz	1	-95.7					
$\hat{E}_s / N_{oc}$	dB	1	4	-infinity	-infinity	2	2	2
SS-RSRP [Note3]	dBm/SCS	1	-91.7	-infinity	-infinity	-93.7	-93.7	-93.7
Io	dBm/95.04 MHz	1	-59.64	-62.59	-62.59	-59.94	-62.59	-62.59
Propagation Condition		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 levels have been derived from other parameters for information purposes. They are not settable parameters themselves.								
Note 4: Information about types of UE beam is given in TS 38.133 in Annex B.2.1.3, and does not limit UE implementation or test system implementation								

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 5 s.

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

7.3.2.1.2 NR SA FR2 - FR2 RRC re-establishment

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

7.3.2.1.2.1 Test purpose

The purpose of this test is to verify that the NR inter-frequency RRC re-establishment delay in FR2 without known target cell is within the specified limits.

7.3.2.1.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.3.2.1.2.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.3.2.1.0

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.2.1.2

7.3.2.1.2.4 Test description

7.3.2.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.3.2.1.2.4.1-1. Configure the test equipment and the DUT according to the parameters in Table 7.3.2.1.2.4.1-2. Test environment parameters are given in Table 7.3.2.1.2.4.1-3.

Table 7.3.2.1.2.4.1-1: Inter-frequency RRC re-establishment in FR2 supported test configurations

Config	Description
1	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 depending on UE capability

Table 7.3.2.1.2.4.1-2: General test parameters for Inter-frequency RRC re-establishment in FR2

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1	Cell1	
	Neighbour cells		1	Cell2	
Final condition	Active cell		1	Cell2	
RF Channel Number			1	1, 2	
Time offset 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 Barring Information		-	1	Not Sent	No additional delays in random access procedure.
SSB configuration			1	SSB.1 FR2	
SMTC configuration			1	SMTC.1	
DRX cycle length		s	1	OFF	
PRACH configuration			1	PRACH.1 FR2	As specified in Annex A.7
T1		s	1	5	
T2		s	1	4.84	Time for the UE to detect RLF (Summation of $T_{Evaluate\_out\_SSB}$ defined in clause 8.1 in TS 38.133, T310 and the period for UE turns off transmitter defined in clause 8.1.5 in TS 38.133)
T3		s	1	6	

Table 7.3.2.1.2.4.1-3: Test Environment Inter-frequency RRC re-establishment in FR2

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table FFS and TS 38.508-1 [14] clause 4.3.1 and 4.4.2		
Channel bandwidth	As specified by the test configuration selected from Table 7.3.2.1.2.4.1-1		
Propagation conditions	AWGN		As specified in Annex C2.2
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram			

1. Message contents are defined in clause 7.3.2.1.2.4.3

2. There are two cells on two NR carriers specified in the test. Cell 1 is the cell used for registration with the power level set according to Annex C.1.1 and C.1.2 for this test.

3. The AoA setup for this test is Setup 1 as defined in clause A.9

7.3.2.1.2.4.2   Test procedure

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.

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

2. Set the parameters according to T1 in Table 7.3.2.1.2.5-1. T1 starts.

3. SS shall transmit an RRCReconfiguration message.

4. The UE shall transmit RRCReconfigurationComplete message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.3.2.1.2.5-1. T2 starts

6. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 7.3.2.1.2.5-1. T3 starts

7. If the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2 within 6 seconds from the beginning of time period T3, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

8. After T3 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

9. Set cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

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

7.3.2.1.2.4.3 Message contents

Same message content as in 7.3.2.1.1.4.3. Table 7.3.2.1.2.4.3-1: Void

Table 7.3.2.1.2.4.3-2: *RLF-TimersAndConstants* for intra-frequency RRC re-establishment

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	**Value/remark**	**Comment**	**Condition**
RLF-TimersAndConstants ::= SEQUENCE {			
t310	ms0		
t311	ms5000		
}			

Table 7.3.2.1.2.4.3-3: *MeasConfig* for intra-frequency RRC re-establishment

Derivation Path: TS 38.508-1 [14], Table 4.6.3-69			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasConfig::= SEQUENCE {			
reportConfigToAddModList	Not present		
measIdToAddModList	Not present		
quantityConfig	Not present		
}			

7.3.2.1.2.5 Test requirement

Table 7.3.2.1.2.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.3.2.1.2.5-1: Cell specific test parameters for NR intra-frequency RRC re-establishment test case in FR2

Parameter	Unit	Test configuration	Cell 1 T1	Cell 1 T2	Cell 1 T3	Cell 2 T1	Cell 2 T2	Cell 2 T3
Assumption for UE beams[Note 4]			Rough			Rough		
AoA setup		1	Setup 3					
			AoA1			AoA2		
TDD configuration		1	TDDConf.3.1			TDDConf.3.1		
PDSCH RMC configuration		1	SR.3.1 TDD			N/A		
RMSI CORESET RMC configuration		1	CR.3.1 FDD			CR.3.1 FDD		
Dedicated CORESET RMC configuration		1	CCR.3.1 FDD			CCR.3.1 FDD		
TRS configuration		1	TRS.2.1 TDD			N/A		
PDSCH/PDCCH TCI state		1	TCI.State.2			N/A		
OCNG Pattern		1	OP.1			OP.1		
Initial DL BWP configuration		1	DLBWP.0.1			DLBWP.0.1		
Initial UL BWP configuration		1	ULBWP.0.1			ULBWP.0.1		
RLM-RS		1	SSB			SSB		
$\hat{E}_s/I_{ot}$	dB	1	5+TT	-infinity	-infinity	-infinity	-infinity	8+TT
N_{oc} [Note2]	dBm/SCS	1	-98+TT					
N_{oc} [Note2]	dBm/15 kHz	1	-89+TT					
$\hat{E}_s/N_{oc}$	dB	1	5+TT	-infinity	-infinity	-infinity	-infinity	8+TT
SS-RSRP [Note3]	dBm/SCS	1	-84+TT	-infinity	-infinity	-infinity	-infinity	-81+TT
Io	dBm/95.04 MHz	1	-53.82+TT	-infinity	-infinity	-infinity	-infinity	-51.37+TT
Propagation Condition		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 levels have been derived from other parameters for information purposes. They are not settable parameters themselves.								
Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation								

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% with a confidence level of 95%.

7.3.2.1.3 NR SA FR2 RRC re-establishment without serving cell timing

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

-The test tolerances and test system uncertainties applicable to this test are undefined.

-Antenna diagram is TBD

-Message content is TBD

7.3.2.1.3.1 Test purpose

The purpose of this test is to verify that the NR intra-frequency RRC re-establishment delay in FR2 without serving cell timing is within the specified limits, and to verify the requirements in TS 38.133 [6] clause 6.2.1

7.3.2.1.3.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.3.2.1.3.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.3.2.1.0

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.2.1.3

7.3.2.1.3.4 Test description

7.3.2.1.3.4.1 Initial conditions

The test shall be tested using any of the test configuration in Table 7.3.2.1.3.4.1-1.

Table 7.3.2.1.3.4.1-1: Supported test configurations for NR SA FR2 - FR2 RRC re-establishment without serving cell timing

Config	Description
1	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 depending on UE capability

Configure the test requirement and the DUT according to the parameters in Table 7.3.2.1.3.4.1-2.

Table 7.3.2.1.3.4.1-2: Initial conditions for NR SA FR2 - FR2 RRC re-establishment without serving cell timing

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5.1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2		
Channel bandwidth	As specified by the test configuration selected from Table 7.3.2.1.3.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	FFS	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	FFS	
Exceptions to connection diagram			

1. The general test parameter settings are set up according to Table 7.3.2.1.3.4.1-3.

2. Message contents are defined in clause 7.3.2.1.3.4.3.

There is one NR carrier and two cells specified in the test. Cell 1 is the cell used for registration with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.3.2.1.3.4.1-3: General test parameters for NR SA FR2 - FR2 RRC re-establishment without serving cell timing

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1	Cell1	
	Neighbour cells		1	Cell2	
Final condition	Active cell		1	Cell2	
RF Channel Number			1	1	
Time offset 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	6000	Radio link failure timer configured by *RLF-TimersAndConstants*
T311		ms	1	5000	RRC re-establishment timer
Access Barring Information		-	1	Not Sent	No additional delays in random access procedure.
SSB configuration			1	SSB.1 FR2	
SMTC configuration			1	SMTC pattern 1	
DRX cycle length		s	1	OFF	
PRACH configuration index			1	PRACH.1 FR2	
T1		s	1	5	
T2		s	1	10.84	Time for the UE to detect RLF (Summation of TEvaluate_out_SSB defined in clause 8.1 in TS 38.133 [6], T310 and the period for UE turns off transmitter defined in clause 8.1.5 in TS 38.133 [6])
T3		s	1	5	

7.3.2.1.3.4.2 Test procedure

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.

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

2. Set the parameters according to T1 in Table 7.3.2.1.3.5-1. T1 starts.

3. SS shall transmit an RRCReconfiguration message.

4. The UE shall transmit RRCReconfigurationComplete message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.3.2.1.3.5-1. T2 starts

6. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 7.3.2.1.3.5-1. T3 starts

7. If the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2 within 5 s from the beginning of time period T3, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

8. After T3 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Cell 1 is the active cell.

9. Set cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

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

7.3.2.1.3.4.3   Message contents

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

Table 7.3.2.1.3.4.3-1: Common Exception messages for NR SA FR2 - FR2 RRC re-establishment without serving cell timing

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

7.3.2.1.3.5   Test requirement

Table 7.3.2.1.3.5-1 defines the primary level settings including test tolerances for NR SA FR2 - FR2 RRC re-establishment without serving cell timing tests.

Table 7.3.2.1.3.5-1: Cell specific test parameters for NR SA FR2 - FR2 RRC re-establishment without serving cell timing

Parameter	Unit	Test configuration	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
Assumption for UE beams[Note 4]			Rough			Rough		
TDD configuration		1	TDDConf.3.1			TDDConf.3.1		
PDSCH RMC configuration		1	SR.3.1 TDD			N/A		
RMSI CORESET RMC configuration		1	CR.3.1 FDD			CR.3.1 FDD		
Dedicated CORESET RMC configuration		1	CCR.3.1 FDD			CCR.3.1 FDD		
TRS configuration		1	TRS.2.1 TDD			N/A		
TCI state		1	CSI-RS.Config.0			N/A		
OCNG Pattern		1	OP.1 defined in A.2.1			OP.1 defined in A.2.1		
Initial DL BWP configuration		1	DLBWP.0.1			DLBWP.0.1		
Initial UL BWP configuration		1	ULBWP.0.1			ULBWP.0.1		
RLM-RS		1	SSB			SSB		
AoA setup		1	Setup 1 defined in A. 9			Setup 1 defined in A.9		
$\hat{E}_s/I_{ot}$	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
Io	dBm/95.04 MHz	1	-62.82	-infinity	-infinity	-infinity	-infinity	-62.82
Propagation Condition		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 levels have been derived from other parameters for information purposes. They are not settable parameters themselves.								
Note 4: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation								

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% with a confidence level of 95%.

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.

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

$N_{freq} = 1$

$T_{identify\_intra\_NR} = 3520$ ms

$T_{SI} = 1280$ ms; it is the time required for receiving all the relevant system information as defined in TS 38.331 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 4865 ms, allow 5 s in the test case.

7.3.2.2 Random access

7.3.2.2.0 Minimum conformance requirements

7.3.2.2.0.1 Minimum conformance requirements for Contention based random access

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

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

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 TS 38.321 [12] clause 5.1.4.

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

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

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

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

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

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

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

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

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

The normative reference for this requirement is TS 38.133 [6] clause 6.2.2.

7.3.2.2.0.2 Minimum conformance requirements for Non-Contention based random access

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

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

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 TS 38.321 [12] clause 5.1.4.

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

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

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

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

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

The normative reference for this requirement is TS 38.133 [6] clause 6.2.2.

Non-contention based random access procedure is not initialized for Other SI requested from UE or for beam failure recovery, so the requirements related to those features are omitted.

7.3.2.2.1 NR SA FR2 contention based random access

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

- The settable window for first preamble uplink power and the uplink calibration process are FFS.

- The test requirement for absolute uplink power is FFS.

- The test requirement for relative uplink power is FFS.

- The uncertainty value and test requirement for PRACH timing are in [ ]

- The results of the TT analysis are provisional until the corresponding MU values are agreed

- Antenna diagram and any exceptions are FFS

- Connection setup in Annex C is FFS

7.3.2.2.1.1 Test purpose

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

7.3.2.2.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.3.2.2.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.3.2.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.2.2.1.

7.3.2.2.1.4 Test description

7.3.2.2.1.4.1 Initial conditions

This test can be run in the configurations defined in Table 7.3.2.2.1.4.1-1.

Table 7.3.2.2.1.4.1-1: Contention based random access test in FR2 for NR standalone supported test configurations

Test Case ID	Test Config Index	Description
7.3.2.2.1-1	1	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 depending on UE capability		

Before the test procedure, Downlink and Uplink calibrations are carried out to derive signalled parameter values. This is necessary to ensure that the test case operates within the specified ranges. The detail of the calibration process is implementation dependent, but shall derive the values of Δ_{DL} and Δ_{UL} according to the following principles:

With the UE configured to report SS-RSRP, the Δ_{DL} value is calculated as (RSRP_REP – RSRP_76), where RSRP_REP is the SS-RSRP Reported value according to TS 38.133 [6] Table 10.1.6.1-1 with -80.6dBm/SCS applied at the Reference point. For a Reported value RSRP_x, x is treated as a positive integer value.

With the UE configured to send a first PRACH preamble, Δ_{UL} value is calculated as -ROUND(PPRACH0 -1), where PPRACH0 is the measured first PRACH power with -80.6dBm/SCS applied at the Reference point, and with signalled values *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm.

Configure the test equipment and the DUT according to the parameters in Table 7.3.2.2.1.4.1-2.

Table 7.3.2.2.1.4.1-2: Test Environment for Contention based random access test in FR2 for NR standalone

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] subclause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.3.2.2.1.4.1-1.		
Propagation conditions	No interference		As specified in Annex C.2.1.
Connection Diagram	TE Part	FFS	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	FFS	
Exceptions to connection diagram	FFS		

1. Message contents are defined in clause 7.3.2.2.1.4.3.

2. Cell 1 is the NR FR2 serving cell (PCell). The connection setup is done according to the settings in FFS.

7.3.2.2.1.4.2 Test procedure

The test consists of a single cell, configured as PCell in FR2. The System Simulator shall not explicitly assign a random access preamble via dedicated signalling in the downlink.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity *NR* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Tables 7.3.2.2.1.5-1 and 7.3.2.2.1.5-2.

3. The UE shall establish a connection setup with SS, the random access procedure within the connection setup is used in the test.

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

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

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

   5.1. Repeat steps 1-3.

   5.2. The UE shall send preambles to the System Simulator. In response to the first 2 preambles, the System Simulator shall transmit a Random Access Response containing Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

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

   5.4. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 3 preambles have been received by the System Simulator.

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

   5.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 7.3.2.2.1.5. Measure the relative power and timing applied to additional preambles (last 2 preambles) and it shall not exceed the values specified in 7.3.2.2.1.5.

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

6.1. Repeat steps 1-3.

6.2. The UE shall send preambles to the System Simulator. The System Simulator shall not respond to the first 2 preambles.

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

6.4. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 3 preambles have been received by the System Simulator.

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

6.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 7.3.2.2.1.5. Measure the relative power and timing applied to additional preambles (last 2 preambles) and it shall not exceed the values specified in 7.3.2.2.1.5.

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

7.1. Repeat steps 1-3.

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

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

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

7.5. The UE shall re-transmit the msg3.

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

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

8.1. Repeat steps 1-3.

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

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

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

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

8.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 7.3.2.2.1.5.

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

9.1. Repeat steps 1-3.

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

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

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

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

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

10.1. Repeat steps 1-3.

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

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

10.4. The System Simulator shall not send a response.

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

10.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 7.3.2.2.1.5.

7.3.2.2.1.4.3   Message contents

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

Table 7.3.2.2.1.4.3-1: *FrequencyInfoUL-SIB* for Contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-62			
Information Element	**Value/remark**	**Comment**	**Condition**
FrequencyInfoUL-SIB SEQUENCE {			
p-Max	23	23 dBm	
}			

Table 7.3.2.2.1.4.3-2: RACH-ConfigCommon for Contention Based Random Access

Information Element	Value/remark	Comment	Condition
Derivation Path: TS 38.508-1 [14], table 4.6.3-128			
RACH-ConfigCommon::= SEQUENCE {			
rach-ConfigGeneric	RACH-ConfigGeneric		
totalNumberOfRA-Preambles	48		
ssb-perRACH-OccasionAndCB-PreamblesPerSSB CHOICE {			
oneFourth	n48		FR2
}			
groupBconfigured SEQUENCE {			
numberOfRA-PreamblesGroupA	48		
}			
ra-ContentionResolutionTimer	sf48		
rsrp-ThresholdSSB	RSRP_69 +Δ_{DL}	Δ_{DL} is derived from the downlink calibration process	
prach-RootSequenceIndex CHOICE {			
0			
}			
msg1-SubcarrierSpacing	kHz 120		
}			

Table 7.3.2.2.1.4.3-3: RACH-ConfigGeneric for Contention Based Random Access

Information Element	Value/remark	Comment	Condition
Derivation Path: TS 38.508-1 [14], table 4.6.3-130			
RACH-ConfigGeneric ::= SEQUENCE {			
prach-ConfigurationIndex	190		FR2
msg1-FDM	one		FR2
zeroCorrelationZoneConfig	11		
preambleReceivedTargetPower	-100		
preambleTransMax	n6		
powerRampingStep	dB2		
ra-ResponseWindow	sl10		
}			

Table 7.3.2.2.1.4.3-4: *ServingCellConfigCommonSIB* for Contention Based Random Access

Information Element	Value/remark	Comment	Condition
Derivation Path: TS 38.508-1 [14], table 4.6.3-169			
ServingCellConfigCommonSIB ::= SEQUENCE {			
ssb-PositionsInBurst SEQUENCE {			
inOneGroup	'1100 0000'B		
}			
ss-PBCH-BlockPower	20 +Δ_{UL}	Δ_{UL} is derived from the uplink calibration process	
}			

7.3.2.2.1.5 Test requirement

Table 7.3.2.2.1.5-2 defines the primary level settings for contention based random access test in FR2 for NR Standalone. Tables 7.3.2.2.1.5-3, 7.3.2.2.1.5-4 and 7.3.2.2.1.5-5 define the Absolute power limits, Relative power limits and uplink timing error limits respectively, and all include test tolerances.

Table 7.3.2.2.1.5-1: General test parameters for contention based random access test in FR2 for NR Standalone

Parameter		Unit	Test-1	Comments
SSB Configuration	Config 1		SSB.1 FR2	As defined in A.3.2
Duplex Mode for Cell 1	Config 1		TDD	
TDD Configuration	Config 1		TDDConf.3.1	As defined in A.1.5
BW$_{channel}$	Config 1	MHz	100: N$_{RB,c}$ = 24	
OCNG Pattern Note 1			OP.3	As defined in A.2.1
PDSCH Reference Channel Note 2	Config 1		SR.3.1 TDD	As defined in A.1.1
RMSI CORESET Reference Channel	Config 1		CR.3.1 TDD	As defined in A.1.2
NR RF Channel Number			1	
EPRE ratio of PSS to SSS		dB		
EPRE ratio of PBCH_DMRS to SSS		dB		
EPRE ratio of PBCH to PBCH_DMRS		dB		
EPRE ratio of PDCCH_DMRS to SSS		dB	0	
EPRE ratio of PDCCH to PDCCH_DMRS		dB		
EPRE ratio of PDSCH_DMRS to SSS		dB		
EPRE ratio of PDSCH to PDSCH_DMRS		dB		
ss-PBCH-BlockPower		dBm/ SCS	+20 +Δ$_{UL}$	As defined in TS 38.331 [13]. Δ$_{UL}$ is derived from the uplink calibration process Note 3
Configured UE transmitted power ($P_{\mathrm{CMAX,\,f,c}}$)		dBm	maximum value configurable for certain power class	As defined in clause 6.2.4 of TS 38.101-2 [3]
PRACH Configuration			PRACH.1 FR2	As defined in A.7.2, with exceptions as defined below
rsrp-ThresholdSSB		dBm	RSRP_69 +Δ$_{DL}$	RSRP_69 corresponds to -88dBm. Δ$_{DL}$ is derived from the downlink calibration process Note 4
preambleReceivedTargetPower		dBm	-100	As defined in TS 38.331 [13]
Note 1: OCNG shall be used such that 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.				
Note 3: The Δ$_{UL}$ value is calculated as -ROUND(PPRACH0 -1), where PPRACH0 is the measured first PRACH power with -80.6dBm/SCS applied, *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm. These values are used during the uplink calibration process carried out before the test case is run, with the UE configured to send PRACH.				
Note 4: The Δ$_{DL}$ value is calculated as (RSRP$_{REP}$ – RSRP_76), where RSRP$_{REP}$ is the SS-RSRP Reported value in Table 10.1.6.1-1 with -80.6dBm/SCS applied. These values are used during the downlink calibration process carried out before the test case is run, with the UE configured to report SS-RSRP. For a Reported value RSRP_x, x is treated as a positive integer value.				

Table 7.3.2.2.1.5-2: OTA-related test parameters for contention based random access test in FR2 for NR Standalone

Parameter		Unit	Test-1	Comments
AoA setup			Setup 1	As defined in A.9.1
Assumption for UE beams[Note 2]			Rough	
SSB with index 0	Es [Note1]	dBm/SCS	-80.6	Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB*
	SSB_RP	dBm/SCS	-80.6	
	Es/Iot$_{BB}$	dB	21.09	
	Io	dBm/95.04 MHz	-56.01	Io in symbols containing SSB index 0
SSB with index 1	Es [Note1]	dBm/SCS	-95.0	Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB*
	SSB_RP	dBm/SCS	-95.0	
	Es/Iot$_{BB}$	dB	6.69	
	Io	dBm/95.04 MHz	-70.41	Io in symbols containing SSB index 1
Propagation Condition		-	AWGN	
Note 1: No artificial noise is applied in this test.				
Note 2: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation				

Test 1: Correct behaviour when transmitting Random Access Preamble

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

Test 2: Correct behaviour when receiving Random Access Response

- The power of the first preamble shall be 0.6 dBm within the accuracy specified in Table 7.3.2.2.1.5-3.

- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 7.3.2.2.1.5-4.

- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 7.3.2.2.1.5-5.

Test 3: Correct behaviour when not receiving Random Access Response

- The power of the first preamble shall be 0.6 dBm within the accuracy specified in Table 7.3.2.2.1.5-3.

- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 7.3.2.2.1.5-4.

- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 7.3.2.2.1.5-5.

Test 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.

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

- The UE shall re-select a preamble and transmit with the calculated PRACH transmission power when the back off time expires.

- The power of the first preamble shall be 0.6 dBm within the accuracy specified in Table 7.3.2.2.1.5-3.

- The transmit timing of the PRACH transmission shall be within the accuracy specified in Table 7.3.2.2.1.5-5.

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

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

Test 7: Correct behaviour when contention resolution timer expires

- The UE shall re-select a preamble and transmit with the calculated PRACH transmission power when the back off time expires if the contention resolution timer expires.

- The power of the first preamble shall be 0.6 dBm within the accuracy specified in Table 7.3.2.2.1.5-3.

- The transmit timing of the PRACH transmission shall be within the accuracy specified in Table 7.3.2.2.1.5-5.

Table 7.3.2.2.1.5-3: Absolute power tolerance Test requirements

Conditions	Tolerance
Normal	± FFS dB

Table 7.3.2.2.1.5-4: Relative power tolerance Test requirements

Measured power	Power step ΔP (dB)	PRACH (dB)
Measured power of both PRACHs being compared > $(P_{max}^{Note1} - 6dB)$	$2 \leq \Delta P < 3$	± (4+FFS).
Measured power of either PRACHs being compared ≤ $(P_{max}^{Note1} - 6dB)$		± (6+FFS)
Note 1: P_{max} is the Min peak EIRP defined in clause 6.2.1 of TS 38.101-2 [3], selected according to power class and operating band.		

Table 7.3.2.2.1.5-5: T_e Timing error Test requirements

Frequency Range	SCS of SSB signals (kHz)	SCS of uplink signals s(KHz)	T_e
2	120	120	224+[48]*T_c
Note 1: T_c is the basic timing unit defined in TS 38.211 [7]			

7.3.2.2.2 NR SA FR2 non-contention based random access

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

- The settable window for first preamble uplink power and the uplink calibration process are FFS.

- The test requirement for absolute uplink power is FFS.

- The test requirement for relative uplink power is FFS.

- The uncertainty value and test requirement for PRACH timing are in [ ]

- The results of the TT analysis are provisional until the corresponding MU values are agreed

- Antenna diagram and any exceptions are FFS

- Connection setup in Annex C is FFS

7.3.2.2.2.1 Test purpose

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

7.3.2.2.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards. Additionally Test 2 is applicable to UE that supports CSI-RS based Random Access Preamble.

7.3.2.2.2.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.3.2.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.2.2.2.

7.3.2.2.2.4   Test description

7.3.2.2.2.4.1   Initial conditions

This test can be run in the configurations defined in Table 7.3.2.2.4.1-1.

Table 7.3.2.2.4.1-1: Non-Contention based random access test in FR2 for NR standalone supported test configurations

Test Case ID	Test Config Index	Description
7.3.2.2.2-1	1	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		

Before the test procedure, Downlink and Uplink calibrations are carried out to derive signalled parameter values. This is necessary to ensure that the test case operates within the specified ranges. The detail of the calibration process is implementation dependent, but shall derive the values of Δ_{DL} and Δ_{UL} according to the following principles:

With the UE configured to report SS-RSRP, the Δ_{DL} value is calculated as (RSRP_REP – RSRP_76), where RSRP_REP is the SS-RSRP Reported value according to TS 38.133 [6] Table 10.1.6.1-1 with -80.6dBm/SCS applied at the Reference point. For a Reported value RSRP_x, x is treated as a positive integer value.

With the UE configured to send a first PRACH preamble, Δ_{UL} value is calculated as -ROUND(PPRACH0 -1), where PPRACH0 is the measured first PRACH power with -80.6dBm/SCS applied at the Reference point, and with signalled values *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm.

Configure the test equipment and the DUT according to the parameters in Table 7.3.2.2.4.1-2.

Table 7.3.2.2.4.1-2: Test Environment for Non-Contention based random access test in FR2 for NR standalone

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] subclause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.3.2.2.4.1-1.		
Propagation conditions	No interference		As specified in Annex C.2.1.
Connection Diagram	TE Part	FFS	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	FFS	
Exceptions to connection diagram	FFS		

1. Message contents are defined in clause 7.3.2.2.2.4.3.

2. Cell 1 is the NR FR2 serving cell (PCell). The connection setup is done according to the settings in FFS.

7.3.2.2.2.4.2   Test procedure

The test consists of a single cell, configured as PCell in FR2. The System Simulator shall explicitly assign a random access preamble via dedicated signalling in the downlink. There are two subtests, to test both SSB-based non-contention based random access (subtest 1) and CSI-RS-based non-contention based random access (subtest 2).

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

2. Set the parameters according to Table 7.3.2.2.2.5-1 Subtest 1.

3. The SS shall signal a Random Access Preamble ID via a PDCCH order to the UE and initiate a Non-contention based Random Access procedure.

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

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

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

    5.1. Set the parameters according to Table 7.3.2.2.2.5-1 Subtest 2.

    5.2. Repeat steps 1-3

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

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

    6.1. Repeat steps 1-3

    6.2. The UE shall send preambles to the System Simulator. In response to the first 2 preambles, the System Simulator shall transmit a Random Access Response containing Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

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

    6.4. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 3 preambles have been received by the System Simulator.

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

    6.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 7.3.2.2.2.5. Measure the relative power and timing applied to additional preambles (last 2 preambles) and it shall not exceed the values specified in 7.3.2.2.2.5.

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

    7.1. Repeat steps 1-3.

    7.2. The UE shall send preambles to the System Simulator. The System Simulator shall not respond to the first 2 preambles.

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

    7.4. The System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier matching the transmitted Random Access Preamble after 3 preambles have been received by the System Simulator.

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

    7.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 7.3.2.2.2.5. Measure the relative power and timing applied to additional preambles (last 2 preambles) and it shall not exceed the values specified in 7.3.2.2.2.5.

7.3.2.2.2.4.3 Message contents

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

Table 7.3.2.2.2.4.3-1: *FrequencyInfoUL-SIB* for Non-Contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-62			
Information Element	**Value/remark**	**Comment**	**Condition**
FrequencyInfoUL-SIB SEQUENCE {			
p-Max	23	23 dBm	
}			

Table 7.3.2.2.2.4.3-2: RACH-ConfigCommon for Non-Contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-128			
Information Element	**Value/remark**	**Comment**	**Condition**
RACH-ConfigCommon::= SEQUENCE {			
rach-ConfigGeneric	RACH-ConfigGeneric		
totalNumberOfRA-Preambles	48		
groupBconfigured SEQUENCE {			
numberOfRA-PreamblesGroupA	48		
}			
ra-ContentionResolutionTimer	Not present		
rsrp-ThresholdSSB	RSRP_69 +Δ_{DL}	Δ_{DL} is derived from the downlink calibration process	Subtest 1
prach-RootSequenceIndex CHOICE {			
0			
}			
msg1-SubcarrierSpacing	kHz 120		
}			

Table 7.3.2.2.2.4.3-3: RACH-ConfigDedicated for Non-Contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-129			
Information Element	**Value/remark**	**Comment**	**Condition**
RACH-ConfigDedicated::= SEQUENCE {			
cfra SEQUENCE {			
occasions SEQUENCE {			
ssb-perRACH-Occasion	oneFourth		
}			
resources CHOICE {			
ssb SEQUENCE {			
ssb-ResourceList SEQUENCE (SIZE(1..maxRA-SSB-Resources)) OF {	2 entries		
ssb[1]	0		
ssb[2]	1		
ra-PreambleIndex[1]	50		Subtest 1
}			
ra-ssb-OccasionMaskIndex	1		Subtest 1
}			
csirs SEQUENCE {			
csirs-ResourceList SEQUENCE (SIZE(1..maxRA- CSIRS -Resources)) OF {			
ra-OccasionList	1		Subtest 2
ra-PreambleIndex[1]	50		Subtest 2
}			
rsrp-ThresholdCSI-RS	RSRP_69 +Δ_{DL}	Δ_{DL} is derived from the downlink calibration process	Subtest 2
}			
}			
}			
}			

Table 7.3.2.2.2.4.3-4: RACH-ConfigGeneric for Non-Contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-130			
Information Element	**Value/remark**	**Comment**	**Condition**
RACH-ConfigGeneric ::= SEQUENCE {			
prach-ConfigurationIndex	190		FR2
msg1-FDM	one		FR2
zeroCorrelationZoneConfig	11		
preambleReceivedTargetPower	-100		
preambleTransMax	n6		
powerRampingStep	dB2		
ra-ResponseWindow	sl10		
}			

Table 7.3.2.2.2.4.3-5: *ServingCellConfigCommonSIB* for Non-Contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-169			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfigCommonSIB ::= SEQUENCE {			
ssb-PositionsInBurst SEQUENCE {			
inOneGroup	'1100 0000'B		
}			
ss-PBCH-BlockPower	20 +Δ_{UL}	Δ_{UL} is derived from the uplink calibration process	
}			

7.3.2.2.2.5 Test requirement

Table 7.3.2.2.2.5-2 defines the primary level settings for non-contention based random access test in FR2 for NR Standalone. Tables 7.3.2.2.2.5-3, 7.3.2.2.2.5-4 and 7.3.2.2.2.5-5 define the Absolute power limits, Relative power limits and uplink timing error limits respectively, and all include test tolerances.

Table 7.3.2.2.2.5-1: General test parameters for non-contention based random access test in FR2 for NR Standalone

Parameter		Unit	Test-1	Test-2	Comments
SSB Configuration	Config 1		SSB.1 FR2	SSB.1 FR2	As defined in A.3.2
CSI-RS Configuration	Config 1		N/A	CSI-RS.3.1 TDD	As defined in A.1.4
Duplex Mode for Cell 2	Config 1		TDD	TDD	
TDD Configuration	Config 1		TDDConf.3.1	TDDConf.3.1	As defined in A.1.5
BW$_{channel}$	Config 1	MHz	100: N$_{RB,c}$ = 24	100: N$_{RB,c}$ = 24	
OCNG Pattern Note 1			OP.3	OP.3	As defined in A.2.1.
PDSCH Reference Channel Note 2	Config 1		SR3.1 TDD	SR3.1 TDD	As defined in A.1.1.
RMSI CORESET Reference Channel	Config 1		CR.3.1 TDD	CR.3.1 TDD	As defined in A.1.2
NR RF Channel Number			1	1	
EPRE ratio of PSS to SSS		dB			
EPRE ratio of PBCH_DMRS to SSS		dB			
EPRE ratio of PBCH to PBCH_DMRS		dB			
EPRE ratio of PDCCH_DMRS to SSS		dB	0	0	
EPRE ratio of PDCCH to PDCCH_DMRS		dB			
EPRE ratio of PDSCH_DMRS to SSS		dB			
EPRE ratio of PDSCH to PDSCH_DMRS		dB			
ss-PBCH-BlockPower		dBm/ SCS	+20 +Δ$_{UL}$	+20 +Δ$_{UL}$	As defined in TS 38.331 [13]. Δ$_{UL}$ is derived from the uplink calibration process Note 3
Configured UE transmitted power ($P_{\mathrm{CMAX,\,f,c}}$)		dBm	maximum value configurable for certain power class	maximum value configurable for certain power class	As defined in clause 6.2.4 in TS 38.101-2 [3]
PRACH Configuration			PRACH.2 FR2	PRACH.3 FR2	As defined in A.7.2, with exceptions as defined below.
rsrp-ThresholdSSB		dBm	RSRP_69 +Δ$_{DL}$	RSRP_69 +Δ$_{DL}$	RSRP_69 corresponds to -88dBm. Δ$_{DL}$ is derived from the downlink calibration process Note 4
preambleReceivedTargetPower		dBm	-100	-100	As defined in TS 38.331 [13]
Note 1: OCNG shall be used such that 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.					
Note 3: The Δ$_{UL}$ value is calculated as -ROUND(PPRACH0 -1), where PPRACH0 is the measured first PRACH power with -80.6dBm/SCS applied, *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm. These values are used during the uplink calibration process carried out before the test case is run, with the UE configured to send PRACH.					
Note 4: The Δ$_{DL}$ value is calculated as (RSRP_REP – RSRP_76), where RSRP_REP is the SS-RSRP Reported value in Table 10.1.6.1-1 with -80.6dBm/SCS applied. These values are used during the downlink calibration process carried out before the test case is run, with the UE configured to report SS-RSRP. For a Reported value RSRP_x, x is treated as a positive integer value.					

Table 7.3.2.2.2.5-2: 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 1	Setup 1	As defined in A.9.1
Assumption for UE beams[Note 2]			Rough	Rough	
SSB with index 0	Es [Note1]	dBm/SCS	-80.6	-80.6	Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB*
	SSB_RP	dBm/SCS	-80.6	-80.6	
	Es/Iot$_{BB}$	dB	21.09	21.09	
	Io	dBm/95.04 MHz	-56.01	-56.01	Io in symbols containing SSB index 0
SSB with index 1	Es [Note1]	dBm/SCS	-95.0	-95.0	Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB*
	SSB_RP	dBm/SCS	-95.0	-95.0	
	Es/Iot$_{BB}$	dB	6.69	6.69	
	Io	dBm/95.04 MHz	-70.41	-70.41	Io in symbols containing SSB index 1
Propagation Condition		-	AWGN	AWGN	
Note 1: No artificial noise is applied in this test. Note 2: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation					

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

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

- The Random Access Preamble shall arrive on a PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0.

- The selected PRACH occasion shall belong to the PRACH occasions permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex*.

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

- The Random Access Preamble shall have the Preamble Index associated with the CSI-RS configured.

- The Random Access Preamble shall arrive on a PRACH occasion which belongs to the PRACH occasions corresponding to the CSI-RS configured.

- The selected PRACH occasion belongs to the PRACH occasions permitted by the restrictions given by the *ra-OccasionList*.

Test 3: Correct behaviour when receiving Random Access Response

- The power of the first preamble shall be 0.6 dBm within the accuracy specified in Table 7.3.2.2.2.5-3.

- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 7.3.2.2.2.5-4.

- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 7.3.2.2.2.5-5.

Test 4: Correct behaviour when not receiving Random Access Response

- The power of the first preamble shall be 0.6 dBm within the accuracy specified in Table 7.3.2.2.2.5-3.

- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 7.3.2.2.2.5-4.

- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 7.3.2.2.2.5-5.

Table 7.3.2.2.2.5-3: Absolute power tolerance Test requirements

Conditions	Tolerance
Normal	± FFS dB

Table 7.3.2.2.2.5-4: Relative power tolerance Test requirements

Measured power	Power step ΔP (dB)	PRACH (dB)
Measured power of both PRACHs being compared > (P_{max}[Note1] – 6dB)	$2 \leq \Delta P < 3$	± (4+FFS).
Measured power of either PRACHs being compared ≤ (P_{max}[Note1] – 6dB)		± (6+FFS)
Note 1: P_{max} is the Min peak EIRP defined in clause 6.2.1 of TS 38.101-2 [3], selected according to power class and operating band.		

Table 7.3.2.2.2.5-5: T_e Timing error Test requirements

Frequency Range	SCS of SSB signals (kHz)	SCS of uplink signals s(KHz)	T_e
2	120	120	224+[48]*T_c
Note 1: T_c is the basic timing unit defined in TS 38.211 [7]			

7.3.2.2.3 NR SA FR2 2-step contention based random access

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

- The settable window for first preamble uplink power and the uplink calibration process are FFS.

- The test requirement for absolute uplink power is FFS.

- The test requirement for relative uplink power is FFS.

- The uncertainty value and test requirement for T_e Timing error are in [ ]

- TT analysis is missing

- Antenna diagram and any exceptions are FFS

- Connection setup in Annex C is FFS

7.3.2.2.3.1 Test purpose

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

7.3.2.2.3.2 Test applicability

This test applies to all types of NR UE supporting 2-step RA type from Release 16 onwards.

7.3.2.2.3.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.3.2.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.2.2.3.

7.3.2.2.3.4   Test description

7.3.2.2.3.4.1   Initial conditions

This test can be run in the configurations defined in Table 7.3.2.2.3.4.1-1.

Table 7.3.2.2.3.4.1-1: 2-step contention based random access test in FR2 for NR standalone supported test configurations

Test Case ID	Test Config Index	Description
7.3.2.2.3-1	1	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 depending on UE capability	

Before the test procedure, Downlink and Uplink calibrations are carried out to derive signalled parameter values. This is necessary to ensure that the test case operates within the specified ranges. The detail of the calibration process is implementation dependent, but shall derive the values of Δ_{DL} and Δ_{UL} according to the following principles:

With the UE configured to report SS-RSRP, the Δ_{DL} value is calculated as (RSRP_REP – RSRP_76), where RSRP_REP is the SS-RSRP Reported value according to TS 38.133 [6] Table 10.1.6.1-1 with -80.6dBm/SCS applied at the Reference point. For a Reported value RSRP_x, x is treated as a positive integer value.

With the UE configured to send a first PRACH preamble, Δ_{UL} value is calculated as -ROUND(PPRACH0 -1), where PPRACH0 is the measured first PRACH power with -80.6dBm/SCS applied at the Reference point, and with signalled values *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm.

Configure the test equipment and the DUT according to the parameters in Table 7.3.2.2.3.4.1-2.

Table 7.3.2.2.3.4.1-2: Test Environment for 2-step RACH contention based random access test in FR2 for NR standalone

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] subclause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.3.2.2.3.4.1-1.		
Propagation conditions	No interference		As specified in Annex C.2.1.
Connection Diagram	TE Part	FFS	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	FFS	
Exceptions to connection diagram	FFS		

1. Message contents are defined in clause 7.3.2.2.3.4.3.

2. Cell 1 is the NR FR2 serving cell (PCell). The connection setup is done according to the settings in FFS.

7.3.2.2.3.4.2   Test procedure

The test consists of a single cell, configured as PCell in FR2. The System Simulator shall not explicitly assign a random access preamble via dedicated signalling in the downlink.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity *NR* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Tables 7.3.2.2.3.5-1 and 7.3.2.2.3.5-2.

3. The UE shall establish a connection setup with SS, the random access procedure within the connection setup is used in the test.

4. Test 1: Correct behaviour when transmitting MsgA

4.1. The UE shall send the MsgA PRACH and MsgA PUSCH to the System Simulator with a preamble which belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured *msgA-RSRP-ThresholdSSB*. The UE shall send the MsgA PUSCH on the MsgA PUSCH occasion that is associated with the chosen preamble.

5. Test 2: Correct behaviour when receiving MsgB

   5.1. Repeat steps 1-3.

   5.2. The UE shall send preambles to the System Simulator. In response to the first 2 preambles, the System Simulator shall transmit a MsgB *not* corresponding to the transmitted Random Access Preamble.

   5.3. The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [20], and transmit MsgA with the calculated MsgA PRACH and MsgA PUSCH transmission power when the backoff time expires if all received MsgB's contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble of MsgA.

   5.4 The System Simulator shall transmit a MsgB containing fallbackRAR message with a Random Access Preamble identifier matching the transmitted MsgA PRACH after 3 MsgA transmissions have been received by the System Simulator.

   5.5 As the received Random Access Response MsgB with a fallbackRAR contains Random Access Preamble identifier corresponding to the transmitted Random Access Preamble, the UE may stop monitoring for MsgB(s) and shall transmit the msg3 on the indicated PUSCH resources.

   5.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 7.3.2.2.3.5. Measure the relative power and timing applied to additional preambles (last 2 preambles) and it shall not exceed the values specified in 7.3.2.2.3.5.

6. Test 3: Correct behaviour when not receiving MsgB

   6.1. Repeat steps 1-3.

   6.2. The UE shall send preambles to the System Simulator. The System Simulator shall not respond to the first 2 preambles.

   6.3. The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [20], and transmit with the calculated MsgA PRACH and MsgA PUSCH transmission power when the backoff time expires if no MsgB is received within the MsgB Response window.

   6.4. Measure the power and timing of the first preamble and it shall not exceed the values specified in 7.3.2.2.3.5. Measure the relative power and timing applied to additional preambles (last 2 preambles) and it shall not exceed the values specified in 7.3.2.2.3.5.

7.3.2.2.3.4.3 Message contents

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

Table 7.3.2.2.3.4.3-1: *FrequencyInfoUL-SIB* for 2-step contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-62			
Information Element	**Value/remark**	**Comment**	**Condition**
FrequencyInfoUL-SIB SEQUENCE {			
p-Max	23	23 dBm	
}			

Table 7.3.2.2.3.4.3-2: RACH-ConfigCommon for 2-step contention Based Random Access

Information Element	Value/remark	Comment	Condition
Derivation Path: TS 38.508-1 [14], table 4.6.3-128A			
RACH-ConfigCommonTwoStepRA-r16 ::= SEQUENCE {			
rach-ConfigGenericTwoStepRA-r16	RACH-ConfigGenericTwoStepRA		
msgA-TotalNumberOfRA-Preambles-r16	48		
msgA-SSB-PerRACH-OccasionAndCB-PreamblesPerSSB-r16 CHOICE {	oneFourth, n48		
one	n4		FR2
}			
msgA-CB-PreamblesPerSSB-PerSharedRO-r16	oneFourth, n48		
msgA-SSB-SharedRO-MaskIndex-r16	Not present		
groupB-ConfiguredTwoStepRA-r16	Not present		
msgA-PRACH-RootSequenceIndex-r16 CHOICE {}	Not present		
msgA-TransMax-r16	N8		
msgA-RSRP-Threshold-r16	RSRP_69 +Δ_{DL}		
msgA-RSRP-ThresholdSSB-r16	RSRP_69 +Δ_{DL}		
msgA-SubcarrierSpacing-r16	120 kHz		
msgA-RestrictedSetConfig-r16	Not present		
ra-PrioritizationForAccessIdentityTwoStep-r16 SEQUENCE {			
ra-Prioritization-r16	RA-Prioritization		
ra-PrioritizationForAI-r16	'10'B		
}			
ra-ContentionResolutionTimer-r16	sf32		
}			

Table 7.3.2.2.3.4.3-3: RACH-ConfigGeneric for 2-step contention Based Random Access

Information Element	Value/remark	Comment	Condition
Derivation Path: TS 38.508-1 [14], table 4.6.3-130A			
RACH-ConfigGenericTwoStepRA-r16 ::= SEQUENCE {			
msgA-PRACH-ConfigurationIndex-r16	190		
msgA-RO-FDM-r16	four		
msgA-RO-FrequencyStart-r16	0		
msgA-ZeroCorrelationZoneConfig-r16	11		
msgA-PreamblePowerRampingStep-r16	dB2		
msgA-PreambleReceivedTargetPower-r16	-100		
msgB-ResponseWindow-r16	sl10		
preambleTransMax-r16	n10		
}			

Table 7.3.2.2.3.4.3-4: *ServingCellConfigCommonSIB* for 2-step contention Based Random Access

Information Element	Value/remark	Comment	Condition
Derivation Path: TS 38.508-1 [14], table 4.6.3-169			
ServingCellConfigCommonSIB ::= SEQUENCE {			
ssb-PositionsInBurst SEQUENCE {			
inOneGroup	'1100 0000'B		
}			
ss-PBCH-BlockPower	20 +Δ_{UL}	Δ_{UL} is derived from the uplink calibration process	
}			

Table 7.3.2.2.3.4.3-5: MsgA-PUSCH-Config for 2-step contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-81B			
Information Element	**Value/remark**	**Comment**	**Condition**
MsgA-PUSCH-Resource-r16 ::= SEQUENCE {			
msgA-MCS	1		
nrofSlotsMsgA-PUSCH	1		
nrofMsgA-PO-PerSlot	1		
msgA-PUSCH-TimeDomainOffset	1		
msgA-PUSCH-TimeDomainAllocation-r16	3	Equivalent to PUSCH start symbol = 0 and allocation length = 10	
mappingTypeMsgA-PUSCH	typeA		
nrofPRBs-PerMsgA-PO	2		
nrofMsgA-PO-FDM	One		
msgA-DMRS-AdditionalPosition	pos1		
msgA-PUSCH-NrofPorts	1		
msgA-DeltaPreamble	3		
msgA-Alpha	alpha1		
deltaMCS	Disabled		
}			

7.3.2.2.3.5   Test requirement

Table 7.3.2.2.3.5-2 defines the primary level settings for 2-step contention based random access test in FR2 for NR Standalone. Tables 7.3.2.2.3.5-3, 7.3.2.2.3.5-4 and 7.3.2.2.3.5-5 define the Absolute power limits, Relative power limits and uplink timing error limits respectively, and all include test tolerances.

Table 7.3.2.2.3.5-1: General test parameters for 2-step contention based random access test in FR2 for NR Standalone

Parameter		Unit	Test-1	Comments
SSB Configuration	Config 1		SSB.1 FR2	As defined in A.3.2
Duplex Mode for Cell 1	Config 1		TDD	
TDD Configuration	Config 1		TDDConf.3.1	As defined in A.1.5
BW$_{channel}$	Config 1	MHz	100: $N_{RB,c}$ = 24	
OCNG Pattern [Note 1]			OCNG pattern 1	As defined in A.2.1
PDSCH Reference Channel [Note 2]	Config 1		SR.3.1 TDD	As defined in A.1.1
RMSI CORESET Reference Channel	Config 1		CR.3.1 TDD	As defined in A.1.2
NR RF Channel Number			1	
EPRE ratio of PSS to SSS		dB		
EPRE ratio of PBCH_DMRS to SSS		dB		
EPRE ratio of PBCH to PBCH_DMRS		dB		
EPRE ratio of PDCCH_DMRS to SSS		dB	0	
EPRE ratio of PDCCH to PDCCH_DMRS		dB		
EPRE ratio of PDSCH_DMRS to SSS		dB		
EPRE ratio of PDSCH to PDSCH_DMRS		dB		
ss-PBCH-BlockPower		dBm/ SCS	+20 +Δ_{UL}	As defined in TS 38.331 [13]. Δ_{UL} is derived from the uplink calibration process [Note 3]
Configured UE transmitted power ($P_{CMAX, f,c}$)		dBm	maximum value configurable for certain power class	As defined in clause 6.2.4 in TS 38.101-2 [3]
MsgA Configuration			FR2 MsgA configuration 1	As defined in A.7.2, with exceptions as defined below
msgA-RSRP-ThresholdSSB		dBm	RSRP_69 +Δ_{DL}	RSRP_69 corresponds to -88dBm. Δ_{DL} is derived from the downlink calibration process [Note 4]
preambleReceivedTargetPower		dBm	-100	As defined in TS 38.331 [13]
Note 1: OCNG shall be used such that 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.				
Note 3: The Δ_{UL} value is calculated as -ROUND(PMsgA0 -1), where PMsgA0 is the measured first MsgA PRACH power with -80.6dBm/SCS applied, *msgA-PreambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm. These values are used during the uplink calibration process carried out before the test case is run, with the UE configured to send MsgA.				
Note 4: The Δ_{DL} value is calculated as (RSRP_REP – RSRP_76), where RSRP_REP is the SS-RSRP Reported value in Table 10.1.6.1-1 with -80.6dBm/SCS applied. These values are used during the downlink calibration process carried out before the test case is run, with the UE configured to report SS-RSRP. For a Reported value RSRP_x, x is treated as a positive integer value.				

Table 7.3.2.2.3.5-2: OTA-related test parameters for 2-step contention based random access test in FR2 for NR Standalone

Parameter		Unit	Test-1	Comments
AoA setup			Setup 2b	As defined in A.9.2.2
Assumption for UE beams[Note 2]			Rough	
SSB with index 0	Es [Note1]	dBm/SCS	-80.6	Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB*
	SSB_RP	dBm/SCS	-80.6	
	Es/Iot$_{BB}$	dB	21.09	
	Io	dBm/95.04 MHz	-56.01	Io in symbols containing SSB index 0
SSB with index 1	Es [Note1]	dBm/SCS	-95.0	Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB*
	SSB_RP	dBm/SCS	-95.0	
	Es/Iot$_{BB}$	dB	6.69	
	Io	dBm/95.04 MHz	-70.41	Io in symbols containing SSB index 1
Propagation Condition		-	AWGN	
Note 1: No artificial noise is applied in this test. Note 2: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation				

Test 1: Correct behaviour when transmitting MsgA

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

Test 2: Correct behaviour when receiving MsgB

- The power of the first MsgA PRACH preamble shall be 0.6 dBm within the accuracy specified in Table 7.3.2.2.3.5-3.

- The power of the first MsgA PUSCH transmission shall be $0.6 + 3(\mu + 2)$ dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [8], where μ indicates the MsgA PUSCH numerology.

- The relative power for MsgA ramping step shall be 2 dB within the accuracy specified in Table 7.3.2.2.3.5-4.

- The transmit timing of all MsgA transmissions shall be within the accuracy specified in Table 7.3.2.2.3.5-5.

Test 3: Correct behaviour when not receiving MsgB

- The power of the first MsgA PRACH preamble shall be 0.6 dBm within the accuracy specified in Table 7.3.2.2.3.5-3.

- The power of the first MsgA PUSCH transmission shall be $0.6 + 3(\mu + 2)$ dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [8], where μ indicates the MsgA PUSCH numerology.

- The relative power for MsgA ramping step shall be 2 dB within the accuracy specified in Table 7.3.2.2.3.5-4.

- The transmit timing of all MsgA transmissions shall be within the accuracy specified in Table 7.3.2.2.3.5-5.

Table 7.3.2.2.3.5-3: Absolute power tolerance Test requirements

Conditions	Tolerance
Normal	± FFS dB

Table 7.3.2.2.3.5-4: Relative power tolerance Test requirements

Measured power	Power step ΔP (dB)	MsgA (dB)
Measured power of both MsgAs being compared > (P_{max}^{Note1} – 6dB)	$2 \leq \Delta P < 3$	± (4+FFS).
Measured power of either MsgAs being compared ≤ (P_{max}^{Note1} – 6dB)		± (6+FFS)
Note 1: P_{max} is the Min peak EIRP defined in clause 6.2.1 of TS 38.101-2 [3], selected according to power class and operating band.		

Table 7.3.2.2.3.5-5: T_e Timing error Test requirements

Frequency Range	SCS of SSB signals (kHz)	SCS of uplink signals s(KHz)	T_e
2	120	120	224+[48]*T_c
Note 1: T_c is the basic timing unit defined in TS 38.211 [7]			

7.3.2.2.4   NR SA FR2 2-step non-contention based random access

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

-       The settable window for first preamble uplink power and the uplink calibration process are FFS.

-       The test requirement for absolute uplink power is FFS.

-       The test requirement for relative uplink power is FFS.

-       The uncertainty value and test requirement for T_e Timing error are in [ ]

-       TT analysis is missing

-       Antenna diagram and any exceptions are FFS

-       Connection setup in Annex C is FFS

7.3.2.2.4.1   Test purpose

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

7.3.2.2.4.2   Test applicability

This test applies to all types of NR SA FR2 UE from Release 16 onwards.

7.3.2.2.4.3   Minimum conformance requirement

Same as in clause 4.3.2.2.4.3.

The normative reference for this requirement is TS 38.133 [6] clause 6.2.2 and A.7.3.2.2.4.

7.3.2.2.4.4   Test description

7.3.2.2.4.4.1   Initial conditions

This test can be run in the configurations defined in Table 7.3.2.2.4.4.1-1.

Table 7.3.2.2.4.4.1-1: 2-step non-contention based random access test in FR2 for NR standalone supported test configurations

Test Case ID	Test Config Index	Description
7.3.2.2.4-1	1	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 depending on UE capability	

Before the test procedure, Downlink and Uplink calibrations are carried out to derive signalled parameter values. This is necessary to ensure that the test case operates within the specified ranges. The detail of the calibration process is implementation dependent, but shall derive the values of Δ_{DL} and Δ_{UL} according to the following principles:

With the UE configured to report SS-RSRP, the Δ_{DL} value is calculated as (RSRP_REP – RSRP_76), where RSRP_REP is the SS-RSRP Reported value according to TS 38.133 [6] Table 10.1.6.1-1 with -80.6dBm/SCS applied at the Reference point. For a Reported value RSRP_x, x is treated as a positive integer value.

With the UE configured to send a first PRACH preamble, Δ_{UL} value is calculated as -ROUND(PPRACH0 -1), where PPRACH0 is the measured first PRACH power with -80.6dBm/SCS applied at the Reference point, and with signalled values *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm.

Configure the test equipment and the DUT according to the parameters in Table 7.3.2.2.4.4.1-2.

Table 7.3.2.2.4.4.1-2: Test Environment for 2-step RACH non-dsscontention based random access test in FR2 for NR standalone

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.3.2.2.4.4.1-1.		
Propagation conditions	No interference		As specified in Annex C.2.1.
Connection Diagram	TE Part	FFS	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	FFS	
Exceptions to connection diagram	FFS		

1. Message contents are defined in clause 7.3.2.2.4.4.3.

2. Cell 1 is the NR FR2 serving cell (PCell). The connection setup is done according to the settings in FFS.

7.3.2.2.4.4.2   Test procedure

The test consists of a single cell, configured as PCell in FR2. The System Simulator shall explicitly assign a random access preamble via dedicated signalling in the downlink.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters Connectivity *NR* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 7.3.2.2.4.5-1 and 7.3.2.2.4.5-2.

3. The UE shall establish a connection setup with SS, the random access procedure within the connection setup is used in the test.

4. Test 1: Correct behaviour when transmitting MsgA:

   4.1. The UE shall send the MsgA PRACH and MsgA PUSCH to the System Simulator with a preamble which belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured *msgA-RSRP-ThresholdSSB*. The UE shall send the MsgA PUSCH on the MsgA PUSCH occasion that is associated with the chosen preamble.

5. Test 2: Correct behaviour when receiving MsgB:

5.1. Repeat steps 1-3.

5.2. The UE shall send preambles to the System Simulator. In response to the first 2 preambles, the System Simulator shall transmit a MsgB containing identifiers that do not match the transmitted Random Access Preamble.

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

5.4. The System Simulator shall transmit a MsgB containing containing fallbackRAR with a Random Access Preamble identifier matching the transmitted Random Access Preamble after 3 MsgA transmissions have been received by the System Simulator.

5.5. As the received MsgB contains a Random Access Preamble identifier that matches the transmitted Random Access Preamble, the UE may stop monitoring for MsgB(s) and shall transmit the msg3 on the indicated PUSCH resources.

5.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 7.3.2.2.4.5. Measure the relative power and timing applied to additional preambles (last 2 preambles) and it shall not exceed the values specified in clause 7.3.2.2.4.5.

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

6.1. Repeat steps 1-3.

6.2. The UE shall send preambles to the System Simulator. The System Simulator shall not respond to the first 2 preambles.

6.3. The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS 38.321 [20], and transmit with the calculated MsgA PRACH and MsgA PUSCH transmission power when the backoff time expires if no MsgB is received within the MsgB Response window in RACH-ConfigGenericTwoStepRA.

6.4. Measure the power and timing of the first preamble and it shall not exceed the values specified in 7.3.2.2.4.5. Measure the relative power and timing applied to additional preambles (last 2 preambles) and it shall not exceed the values specified in 7.3.2.2.4.5.

7.3.2.2.4.4.3 Message contents

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

Table 7.3.2.2.4.4.3-1: *FrequencyInfoUL-SIB* for 2-step non-contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-62			
Information Element	**Value/remark**	**Comment**	**Condition**
FrequencyInfoUL-SIB SEQUENCE {			
p-Max	23	23 dBm	
}			

Table 7.3.2.2.4.4.3-2: RACH-ConfigCommon for 2-step non-contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-128A			
Information Element	**Value/remark**	**Comment**	**Condition**
RACH-ConfigCommonTwoStepRA-r16 ::= SEQUENCE {			
rach-ConfigGenericTwoStepRA-r16	RACH-ConfigGenericTwoStepRA		
msgA-TotalNumberOfRA-Preambles-r16	48		
msgA-SSB-SharedRO-MaskIndex-r16	Not present		
groupB-ConfiguredTwoStepRA-r16	Not present		
msgA-PRACH-RootSequenceIndex-r16 CHOICE {}	Not present		
msgA-TransMax-r16	N8		
msgA-RSRP-Threshold-r16	RSRP_69 +Δ_{DL}		
msgA-RSRP-ThresholdSSB-r16	RSRP_69 +Δ_{DL}		
msgA-SubcarrierSpacing-r16	120 kHz		
msgA-RestrictedSetConfig-r16	Not present		
ra-PrioritizationForAccessIdentityTwoStep-r16 SEQUENCE {			
ra-Prioritization-r16	RA-Prioritization		
ra-PrioritizationForAI-r16	'10'B		
}			
ra-ContentionResolutionTimer-r16	Not present		
}			

Table 7.3.2.2.2.4.3-3: RACH-ConfigDedicated for Non-Contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-129			
Information Element	**Value/remark**	**Comment**	**Condition**
RACH-ConfigDedicated::= SEQUENCE {			
cfra SEQUENCE {			
occasions SEQUENCE {			
ssb-perRACH-Occasion	oneFourth		
}			
resources CHOICE {			
ssb SEQUENCE {			
ssb-ResourceList SEQUENCE (SIZE(1..maxRA-SSB-Resources)) OF {	2 entries		
ssb[1]	0		
ssb[2]	1		
ra-PreambleIndex[1]	50		Subtest 1
}			
ra-ssb-OccasionMaskIndex	1		Subtest 1
}			
csirs SEQUENCE {			
csirs-ResourceList SEQUENCE (SIZE(1..maxRA- CSIRS -Resources)) OF {			
ra-OccasionList	1		Subtest 2
ra-PreambleIndex[1]	50		Subtest 2
}			
rsrp-ThresholdCSI-RS	RSRP_69 +Δ_{DL}	Δ_{DL} is derived from the downlink calibration process	Subtest 2
}			
}			
}			
}			

Table 7.3.2.2.4.4.3-3: RACH-ConfigGeneric for 2-step non-contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-130A			
Information Element	**Value/remark**	**Comment**	**Condition**
RACH-ConfigGenericTwoStepRA-r16 ::= SEQUENCE {			
msgA-PRACH-ConfigurationIndex-r16	190		
msgA-RO-FDM-r16	four		
msgA-RO-FrequencyStart-r16	0		
msgA-ZeroCorrelationZoneConfig-r16	11		
msgA-PreamblePowerRampingStep-r16	dB2		
msgA-PreambleReceivedTargetPower-r16	-100		
msgB-ResponseWindow-r16	sl10		
preambleTransMax-r16	n10		
}			

Table 7.3.2.2.4.4.3-4: *ServingCellConfigCommonSIB* for 2-step non-contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-169			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfigCommonSIB ::= SEQUENCE {			
ssb-PositionsInBurst SEQUENCE {			
inOneGroup	'1100 0000'B		
}			
ss-PBCH-BlockPower	$20 + \Delta_{UL}$	Δ_{UL} is derived from the uplink calibration process	
}			

Table 7.3.2.2.4.4.3-5: MsgA-PUSCH-Config for 2-step non-contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-81B			
Information Element	**Value/remark**	**Comment**	**Condition**
MsgA-PUSCH-Resource-r16 ::= SEQUENCE {			
msgA-MCS	1		
nrofSlotsMsgA-PUSCH	1		
nrofMsgA-PO-PerSlot	1		
msgA-PUSCH-TimeDomainOffset	1		
msgA-PUSCH-TimeDomainAllocation-r16	3	Equivalent to PUSCH start symbol = 0 and allocation length = 10	
mappingTypeMsgA-PUSCH	typeA		
nrofPRBs-PerMsgA-PO	2		
nrofMsgA-PO-FDM	One		
msgA-DMRS-AdditionalPosition	pos1		
msgA-PUSCH-NrofPorts	1		
msgA-DeltaPreamble	3		
msgA-Alpha	alpha1		
deltaMCS	Disabled		
}			

7.3.2.2.4.5   Test requirement

Table 7.3.2.2.4.5-2 defines the primary level settings for 2-step non-contention based random access test in FR2 for NR Standalone. Tables 7.3.2.2.4.5-3, 7.3.2.2.4.5-4 and 7.3.2.2.4.5-5 define the Absolute power limits, Relative power limits and uplink timing error limits respectively, and all include test tolerances.

Table 7.3.2.2.4.5-1: General test parameters for non-contention based random access test for 2-step RA type in FR2 for NR Standalone

Parameter		Unit	Test-1	Comments
SSB Configuration	Config 1		SSB.1 FR2	As defined in A.3.10
Duplex Mode for Cell 1	Config 1		TDD	
TDD Configuration	Config 1		TDDConf.3.1	
BW$_{channel}$	Config 1	MHz	100: N$_{RB,c}$ = 24	
OCNG Pattern [Note 1]			OP.3	As defined in A.3.2.1.
PDSCH Reference Channel [Note 2]	Config 1		SR3.1 TDD	As defined in A.3.1.1.
NR RF Channel Number			1	
EPRE ratio of PSS to SSS		dB	0	
EPRE ratio of PBCH_DMRS to SSS		dB		
EPRE ratio of PBCH to PBCH_DMRS		dB		
EPRE ratio of PDCCH_DMRS to SSS		dB		
EPRE ratio of PDCCH to PDCCH_DMRS		dB		
EPRE ratio of PDSCH_DMRS to SSS		dB		
EPRE ratio of PDSCH to PDSCH_DMRS		dB		
ss-PBCH-BlockPower		dBm/SCS	+20 +Δ$_{UL}$	As defined in TS 38.331 [2]. Δ$_{UL}$ is derived from the uplink calibration process [Note 3]
Configured UE transmitted power (P$_{CMAX,f,c}$)		dBm	maximum value configurable for certain power class	As defined in clause 6.2.4 in TS 38.101-2 [19]
MsgA Configuration			FR2 MsgA configuration 2	As defined in A.3.20.3, with exceptions as defined below.
msgA-RSRP-ThresholdSSB		dBm	RSRP_69 +Δ$_{DL}$	RSRP_69 corresponds to -88dBm. Δ$_{DL}$ is derived from the downlink calibration process [Note 4]
msgA-PreambleReceivedTargetPower		dBm	-100	As defined in TS 38.331 [2]
Note 1: OCNG shall be used such that 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.				
Note 3: The Δ$_{UL}$ value is calculated as -ROUND(P$_{MsgA0}$ -1), where P$_{MsgA0}$ is the measured first MsgA PRACH power with -80.6dBm/SCS applied, *msgA-PreambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm. These values are used during the uplink calibration process carried out before the test case is run, with the UE configured to send MsgA.				
Note 4: The Δ$_{DL}$ value is calculated as (RSRP$_{REP}$ – RSRP_76), where RSRP$_{REP}$ is the SS-RSRP Reported value in Table 10.1.6.1-1 with -80.6dBm/SCS applied. These values are used during the downlink calibration process carried out before the test case is run, with the UE configured to report SS-RSRP. For a Reported value RSRP_x, x is treated as a positive integer value.				

Table 7.3.2.2.4.5-2 OTA-related test parameters for non-contention based random access test for 2-step RA type in FR2 for NR Standalone

Parameter		Unit	Test-1	Comments
AoA setup			Setup 1	As defined in A.3.15.1
Assumption for UE beams Note 2			Rough	
SSB with index 0	Es Note1	dBm/SCS	-80.6	Power of SSB with index 0 is set to be above configured *msgA-RSRP-ThresholdSSB*
	SSB_RP	dBm/SCS	-80.6	
	Es/Iot$_{BB}$	dB	21.09	
	Io	dBm/95.04 MHz	-56.01	Io in symbols containing SSB index 0
SSB with index 1	Es Note1	dBm/SCS	-95.0	Power of SSB with index 1 is set to be below configured *msgA-RSRP-ThresholdSSB*
	SSB_RP	dBm/SCS	-95.0	
	Es/Iot$_{BB}$	dB	6.69	
	Io	dBm/95.04 MHz	-70.41	Io in symbols containing SSB index 1
Propagation Condition		-	AWGN	
Note 1: No artificial noise is applied in this test.				
Note 2: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation				

Test 1: Correct behaviour when transmitting MsgA

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

Test 2: Correct behaviour when receiving MsgB

- The power of the first MsgA PRACH preamble shall be 0.6 dBm within the accuracy specified in Table 7.3.2.2.4.5-3.

- The power of the first MsgA PUSCH transmission shall be $0.6 + 3(\mu + 2)$ dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [8], where μ indicates the MsgA PUSCH numerology.

- The relative power for MsgA ramping step shall be 2 dB within the accuracy specified in Table 7.3.2.2.4.5-4.

- The transmit timing of all MsgA transmissions shall be within the accuracy specified in Table 7.3.2.2.4.5-5.

Test 3: Correct behaviour when not receiving MsgB

- The power of the first MsgA PRACH preamble shall be 0.6 dBm within the accuracy specified in Table 7.3.2.2.4.5-3.

- The power of the first MsgA PUSCH transmission shall be $0.6 + 3(\mu + 2)$ dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [8], where μ indicates the MsgA PUSCH numerology.

- The relative power for MsgA ramping step shall be 2 dB within the accuracy specified in Table 7.3.2.2.4.5-4.

- The transmit timing of all MsgA transmissions shall be within the accuracy specified in Table 7.3.2.2.4.5-5.

Table 7.3.2.2.4.5-3: Absolute power tolerance Test requirements

Conditions	Tolerance
Normal	± FFS dB

Table 7.3.2.2.4.5-4: Relative power tolerance Test requirements

Measured power	Power step ΔP (dB)	MsgA (dB)
Measured power of both MsgAs being compared > (P_{max}^{Note1} − 6dB)	2 ≤ ΔP < 3	± (4+FFS).
Measured power of either MsgAs being compared ≤ (P_{max}^{Note1} − 6dB)		± (6+FFS)
Note 1: P_{max} is the Min peak EIRP defined in clause 6.2.1 of TS 38.101-2 [3], selected according to power class and operating band.		

Table 7.3.2.2.4.5-5: T_e Timing error Test requirements

Frequency Range	SCS of SSB signals (kHz)	SCS of uplink signals s(KHz)	T_e
2	120	120	224+[48]*T_c
Note 1: T_c is the basic timing unit defined in TS 38.211 [7]			

7.3.2.3 RRC connection release with redirection

7.3.3 Conditional handover

7.3.3.0 Minimum conformance requirements

7.3.3.0.1 Minimum conformance requirements for NR FR2 intra-frequency conditional handover

[TS 38.133, clause 6.1.4.4.1]

Procedure delays for all procedures that can command a conditional handover are specified in TS 38.331 [13].

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

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

Where:

T_{RRC} is the RRC procedure delay defined in clause 12 in TS 38.331 [13].

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

$T_{measure}$ is the measurements time stated in TS 38.133 [6] clause 6.1.4.4.2.

$T_{CHO\_execution}$ is the conditional execution preparation time in TS 38.133 [6] clause 6.1.4.4.3.

$T_{interrupt}$ is the interruption time stated in TS 38.133 [6] clause 6.1.4.4.4.

[TS 38.133, clause 6.1.4.4.2]

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

For intra-frequency handover, the measurement time delay measured without Time To Trigger (TTT) and L3 filtering shall be less than $T_{identify\ intra\ with\ index}$ or $T_{identify\_intra\_without\_index}$ defined in TS 38.133 [6] clause 9.2.5.1 or clause 9.2.6.2.

When TTT or 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 $T_{identify\_intra\_without\_index}$ or $T_{identify\_intra\_with\_index}$ for intra-frequency handover or $T_{identify\_inter\_without\_index}$ for inter-frequency handover. If a cell which has been detectable at least for the time period $T_{identify\_intra\_without\_index}$ or $T_{identify\_intra\_with\_index}$ for intra-frequency handover or $T_{identify\_inter\_without\_index}$ for inter-frequency handover becomes undetectable for a period and then the cell becomes detectable again and triggers a handover, the measurement time delay shall be less than $T_{SSB\_measurement\_period\_intra}$ or $T_{SSB\_measurement\_period\_inter}$ provided the timing to that cell has not changed more than ± 3200 Tc while the measurement gap has not been available and the L3 filter has not been used. When L3 filtering is used, an additional delay can be expected.

[TS 38.133, clause 6.1.4.4.3]

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

[TS 38.133, clause 6.1.4.4.4]

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

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

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

Where:

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

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 [8]

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

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

T_{rs} 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_{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 [13] signaling of *smtc2* prior to the handover command, T_{rs} follows *smtc1* or *smtc2* according to the physical cell ID of the target cell.

NOTE 1: The actual value of T_{IU} shall depend upon the PRACH configuration used in the target cell.[TS 38.133, clause 9.2.2]

The requirements in TS 38.133 [6] 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 TS 38.133 [6] clauses 10.1.3 for FR2, for a corresponding Band,

- SSB_RP and SSB Ês/Iot according to TS 38.133 [6] Annex B.2.2 for a corresponding Band.

[TS 38.133, clause 9.2.5.1]

The UE shall be able to identify a new detectable intra-frequency cell within $T_{identify\_intra\_without\_index}$ if the 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 $T_{identify\_intra\_with\_index}$. The UE shall be able to identify a new detectable intra frequency SS block of an already detected cell within $T_{identify\_intra\_without\_index}$. It is assumed that *deriveSSB-IndexFromCell* is always enabled for FR1 TDD and FR2.

$$T_{identify\_intra\_without\_index} = (T_{PSS/SSS\_sync\_intra} + T_{SSB\_measurement\_period\_intra})\ ms$$

Where:

T_{PSS/SSS_sync_intra}: it is the time period used in PSS/SSS detection given in TS38.133 [6] Table 9.2.5.1-2

$T_{SSB\_measurement\_period\_intra}$: equal to a measurement period of SSB based measurement given in TS38.133 [6] Table 9.2.5.2-2

$CSSF_{intra}$: it is a carrier specific scaling factor and is determined

according to $CSSF_{outside\_gap,i}$ in clause 9.1.5.1 for measurement conducted outside measurement gaps, i.e. when intra-frequency SMTC is fully non overlapping or partially overlapping with measurement gaps.

$M_{pss/sss\_sync\_w/o\_gaps}$: 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

$M_{meas\_period\_w/o\_gaps}$: 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 intra-frequency SMTC is fully non overlapping with measurement gaps or intra-frequency SMTC is fully overlapping with MGs, Kp=1

For FR2,

$K_{layer1\_measurement}$=1,

- if all of the reference signals configured for RLM, BFD, CBD or L1-RSRP for beam reporting on any FR2 serving frequency in the same band outside measurement gap are not fully overlapped by intra-frequency SMTC occasions

Table 9.2.5.1-2: Time period for PSS/SSS detection, (Frequency range FR2)

DRX cycle	T_{PSS/SSS_sync_intra}
No DRX	max(600ms, ceil($M_{pss/sss\_sync\_w/o\_gaps}$ x K_P x $K_{layer1\_measurement}$) x SMTC period)[Note 1] x $CSSF_{intra}$
DRX cycle≤ 320ms	max(600ms, ceil(1.5 x $M_{pss/sss\_sync\_w/o\_gaps}$ x K_P x $K_{layer1\_measurement}$) x max(SMTC period,DRX cycle)) x $CSSF_{intra}$
DRX cycle>320ms	ceil($M_{pss/sss\_sync\_w/o\_gaps}$ x K_P x $K_{layer1\_measurement}$) x DRX cycle x $CSSF_{intra}$
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified	

[TS 38.133, clause 9.2.5.1]

The measurement period for intra-frequency measurements without gaps is as shown in 38.133 [6] Table 9.2.5.2-2.

For FR2, a longer measurement period is allowed, if aperiodic CSI-RS resource is measured for L1-RSRP measurement on any FR2 serving frequency in the same band, and the CSI-RS resource is outside measurement gap and overlapped with any of the SSB symbols and the RSSI symbols, and 1 symbol before each consecutive SSB symbols and the RSSI symbols, and 1 symbol after each consecutive SSB symbols and the RSSI symbols. If *SSB-ToMeasure* or *SS-RSSI-Measurement* is configured, the SSB symbols are indicated by the union set of *SSB-ToMeasure* from all the configured measurement objects on the same band which can be merged and the RSSI symbols are indicated by *SS-RSSI-Measurement*.

Table 9.2.5.2-2: Measurement period for intra-frequency measurements without gaps(FR2)

DRX cycle	$T_{SSB\_measurement\_period\_intra}$
No DRX	$\max(400ms, \text{ceil}(M_{meas\_period\_w/o\_gaps} \times K_p \times K_{layer1\_measurement}) \times \text{SMTC period})^{\text{Note 1}} \times CSSF_{intra}$
DRX cycle ≤ 320ms	$\max(400ms, \text{ceil}(1.5 \times M_{meas\_period\_w/o\_gaps} \times K_p \times K_{layer1\_measurement}) \times \max(\text{SMTC period}, \text{DRX cycle})) \times CSSF_{intra}$
DRX cycle > 320ms	$\text{ceil}(M_{meas\_period\_w/o\_gaps} \times K_p \times K_{layer1\_measurement}) \times \text{DRX cycle} \times CSSF_{intra}$
NOTE 1:	If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified

[TS 38.133, clause 10.1.3.1.1]

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 TS 38.133 [6] Table 10.1.3.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.

- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each relevant SSB.

- 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 [3].

Table 10.1.3.1.1-1: SS-RSRP Intra frequency absolute accuracy in FR2

Accuracy		SSB Ês/Iot	Conditions		
Normal condition	Extreme condition		I_o [Note 2] range		
				Minimum Io	Maximum Io
dB	dB	dB	dBm / SCS$_{SSB}$ [Note 1]	dBm/BW$_{Channel}$	dBm/BW$_{Channel}$
			SCS$_{SSB}$ = 120kHz SCS$_{SSB}$ = 240kHz		
±6	±9	≥-6	Same value as SSB_RP in TS 38.133 [6] 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 [3]. 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/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.				

[TS 38.133, annex B.2.2]

This clause defines the following conditions for NR intra-frequency measurements and corresponding procedures performed based on SSBs: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in TS 38.133 [6] Table B.2.2-2 for FR2 NR cells.

Table B.2.2-2: Conditions for intra-frequency measurements in FR2

Parameter	Angle of arrival	NR operating bands	Minimum SSB_RP [Note 2, Note 3]						SSB Ês/Iot
			dBm / SCS$_{SSB}$						dB
			SCS$_{SSB}$ = 120 kHz					SCS$_{SSB}$ = 240 kHz	
			UE Power class					UE Power class	
			1	2	3	4	5	1, 2, 3, 4, 5	
Conditions	Rx Beam Peak	n257	-128.3+Y_1	-113.8	-112.1	-127.8+Y_4	-123.4+Y_5	(Value for SCS$_{SSB}$ = 120 kHz) +3dB	≥-6
		n258	-128.3+Y_1	-113.8	-112.1	-127.8+Y_4	-123.6+Y_5		
		n260	-125.3+Y_1		-109.5	-125.8+Y_4			
		n261	-128.3+Y_1	-113.8	-112.1	-127.8+Y_4			
		n262	-123.3+Y_1	108,6	-106.6	-121.8+Y_4			
	Spherical coverage Note 1	n257	-120.3+Z_1	-102.8	-101.2	-118.8+Z_4	-115.4+Z_5	(Value for SCS$_{SSB}$ = 120 kHz) +3dB	≥-6
		n258	-120.3+Z_1	-102.8	-101.2	-118.8+Z_4	-115.6+Z_5		
		n260	-117.3+Z_1		-96.9	-113.8+Z_4			
		n261	-120.3+Z_1	-102.8	-101.2	-118.8+Z_4			
		n262	-115.1+Z_1	-96.7	-93.5	-109.7+Z_4			

Note 1:	Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [3]. 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/Iot, with no applied noise.
Note 3:	For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by $\Delta MB_{P,n}$ and Spherical coverage values are increased by $\Delta MB_{S,n}$, the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [3].

7.3.3.0.2 Minimum conformance requirements for NR FR2 inter-frequency conditional handover

[TS 38.133, clause 6.1.4.4.1]

Procedure delays for all procedures that can command a conditional handover are specified in TS 38.331 [13].

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

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

Where:

T_{RRC} is the RRC procedure delay defined in clause 12 in TS 38.331 [13].

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

$T_{measure}$ is the measurements time stated in TS 38.133 [6] clause 6.1.4.4.2.

$T_{CHO\_execution}$ is the conditional execution preparation time in TS 38.133 [6] clause 6.1.4.4.3.

$T_{interrupt}$ is the interruption time stated in TS 38.133 [6] clause 6.1.4.4.4.

[TS 38.133, clause 6.1.4.4.2]

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

For intra-frequency handover, the measurement time delay measured without Time To Trigger (TTT) and L3 filtering shall be less than $T_{identify\ intra\ with\ index}$ or $T_{identify\_intra\_without\_index}$ defined in TS 38.133 [6] clause 9.2.5.1 or clause 9.2.6.2.

When TTT or 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 $T_{identify\_intra\_without\_index}$ or $T_{identify\_intra\_with\_index}$ for intra-frequency handover or $T_{identify\_inter\_without\_index}$ for inter-frequency handover. If a cell which has been detectable at least for the time period $T_{identify\_intra\_without\_index}$ or $T_{identify\_intra\_with\_index}$ for intra-frequency handover or $T_{identify\_inter\_without\_index}$ for inter-frequency handover becomes undetectable for a period and then the cell becomes detectable again and triggers a handover, the measurement time delay shall be less than $T_{SSB\_measurement\_period\_intra}$ or $T_{SSB\_measurement\_period\_inter}$ provided the timing to that cell has not changed more than ± 3200 Tc while the measurement gap has not been available and the L3 filter has not been used. When L3 filtering is used, an additional delay can be expected.

[TS 38.133, clause 6.1.4.4.3]

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

[TS 38.133, clause 6.1.4.4.4]

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

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

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

Where:

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

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 [8]

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

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

T_{rs} 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 $T_{rs}=5ms$ 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 [13] signaling of *smtc2* prior to the handover command, T_{rs} follows *smtc1* or *smtc2* according to the physical cell ID of the target cell.

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

[TS 38.133, clause 9.3.2]

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 TS 38.133 [6] clauses 10.1.5 for FR2, for a corresponding Band,

-   SSB_RP and SSB Ês/Iot according to TS 38.133 [6] Annex B.2.3 for a corresponding Band.

[TS 38.133, clause 9.3.4]

When measurement gaps are provided, or the UE supports capability of conducting such measurements without gaps, the UE shall be able to identify a new detectable inter frequency cell within $T_{identify\_inter\_without\_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured). Otherwise UE shall be able to identify a new detectable inter frequency cell within $T_{identify\_inter\_with\_index}$. The UE shall be able to identify a new detectable inter frequency SS block of an already detected cell within $T_{identify\_inter\_without\_index}$.

$$T_{identify\_inter\_without\_index} = (T_{PSS/SSS\_sync\_inter} + T_{SSB\_measurement\_period\_inter})\ ms$$

$$T_{identify\_inter\_with\_index} = (T_{PSS/SSS\_sync\_inter} + T_{SSB\_measurement\_period\_inter} + T_{SSB\_time\_index\_inter})\ ms$$

Where:

T_{PSS/SSS_sync_inter}: it is the time period used in PSS/SSS detection given in 38.133 [6] 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 38.133 [6] Table 9.3.4-4.

$T_{SSB\_measurement\_period\_inter}$: equal to a measurement period of SSB based measurement given in 38.133 [6] 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.

$CSSF_{inter}$: it is a carrier specific scaling factor and is determined according to $CSSF_{within\_gap,i}$ in clause 9.1.5.2 for measurement conducted within measurement gaps.

Table 9.3.4-2: Time period for PSS/SSS detection, (Frequency range FR2)

Condition [NOTE1,2]	T_{PSS/SSS_sync_inter}
No DRX	Max(600ms, M_{pss/sss_sync_inter} × Max(MGRP, SMTC period)) × $CSSF_{inter}$
DRX cycle ≤ 320ms	Max(600ms, (1.5 × M_{pss/sss_sync_inter}) × Max(MGRP, SMTC period, DRX cycle)) × $CSSF_{inter}$
DRX cycle > 320ms	M_{pss/sss_sync_inter} × DRX cycle × $CSSF_{inter}$
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.	

Table 9.3.4-4: Time period for time index detection (Frequency range FR2)

Condition [NOTE1,2]	$T_{SSB\_time\_index\_inter}$
No DRX	Max(200ms, $M_{SSB\_index\_inter}$ × Max(MGRP, SMTC period)) × $CSSF_{inter}$
DRX cycle ≤ 320ms	Max(200ms, (1.5 × $M_{SSB\_index\_inter}$) × Max(MGRP, SMTC period, DRX cycle)) × $CSSF_{inter}$
DRX cycle > 320ms	$M_{SSB\_index\_inter}$ × DRX cycle × $CSSF_{inter}$
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.	

[TS 38.133, clause 9.3.5]

When measurement gaps are provided for inter frequency measurements, or the UE supports capability of conducting such measurements without gaps, the UE physical layer shall be capable of reporting SS-RSRP, SS-RSRQ and SS-

SINR measurements to higher layers with measurement accuracy as specified in TS 38.133 [6] clauses 10.1.4, 10.1.5, 10.1.9, 10.1.10, 10.1.14 and 10.1.15, respectively, as shown in TS 38.133 [6] Table and 9.3.5-2:

Table 9.3.5-2: Measurement period for inter-frequency measurements with gaps (Frequency FR2)

Condition NOTE1,2	$T_{SSB\_measurement\_period\_inter}$
No DRX	$\text{Max}(400\text{ms}, M_{meas\_period\_inter} \times \text{Max}(\text{MGRP}, \text{SMTC period})) \times \text{CSSF}_{inter}$
DRX cycle ≤ 320ms	$\text{Max}(400\text{ms}, (1.5 \times M_{meas\_period\_inter}) \times \text{Max}(\text{MGRP}, \text{SMTC period}, \text{DRX cycle})) \times \text{CSSF}_{inter}$
DRX cycle > 320ms	$M_{meas\_period\_inter} \times \text{DRX cycle} \times \text{CSSF}_{inter}$
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.	

[TS 38.133, clause 10.1.5.1.1]

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 TS 38.133 [6] Table 10.1.5.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [3] for reference sensitivity are fulfilled.

- Conditions for inter-frequency measurements are fulfilled according to TS 38.133 [6] 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 [3].

Table 10.1.5.1.1-1: SS-RSRP Inter frequency absolute accuracy in FR2

Accuracy		SSB Ês/Iot	Conditions			
Normal condition	Extreme condition		I_o Note 2 range			
			Minimum Io			Maximum Io
dB	dB	dB	dBm / SCS$_{SSB}$ Note 1		dBm/BW$_{Channel}$	dBm/BW$_{Channel}$
			SCS$_{SSB}$ = 120kHz	SCS$_{SSB}$ = 240kHz		
±6	±9	≥-4	Same value as SSB_RP in Table B.2.3-2, 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 [3]. 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/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.						

[TS 38.133, annex B.2.3]

This clause defines the following conditions for NR inter-frequency measurements and corresponding procedures performed based on SSBs: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.2.3-2 for FR2 NR cells.

Table B.2.3-2: Conditions for inter-frequency measurements in FR2

Parameter	Angle of arrival	NR operating bands	Minimum SSB_RP [Note 2, Note 3]						SSB Ês/Iot
			dBm / SCS_{SSB}						dB
			SCS_{SSB} = 120 kHz					SCS_{SSB} = 240 kHz	
			UE Power class					UE Power class	
			1	2	3	4	5	1, 2, 3, 4, 5	
Conditions	Rx Beam Peak	n257	-126.3+Y_1	-111.8	-110.1	-125.8+Y_4	-121.4+Y_5	(Value for SCS_{SSB} = 120 kHz) +3dB	≥-4
		n258	-126.3+Y_1	-111.8	-110.1	-125.8+Y_4	-121.6+Y_5		
		n260	-123.3+Y_1		-107.5	-123.8+Y_4			
		n261	-126.3+Y_1	-111.8	-110.1	-125.8+Y_4			
		n262	-121.3+Y_1	-106.6	-104.6	-119.8+Y_4			
	Spherical coverage [Note 1]	n257	-118.3+Z_1	-100.8	-99.2	-116.8+Z_4	-113.4+Z_5	(Value for SCS_{SSB} = 120 kHz) +3dB	≥-4
		n258	-118.3+Z_1	-100.8	-99.2	-116.8+Z_4	-113.6+Z_5		
		n260	-115.3+Z_1		-94.9	-111.8+Z_4			
		n261	-118.3+Z_1	-100.8	-99.2	-116.8+Z_4			
		n262	-113.1+Z_1	-94.7	-91.5	-107.7+Z_4			

NOTE 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [3]. 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/Iot, with no applied noise.
NOTE 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by $\Delta MB_{P,n}$ and Spherical coverage values are increased by $\Delta MB_{S,n}$, the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [3].

7.3.3.1 NR SA FR2 conditional handover

Editor's Note: This test case is complete for the following configurations:

- Test frequency f ≤ 40.8 GHz.

- UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

7.3.3.1.1 Test purpose

To verify the requirement for the NR FR2 intra frequency conditional handover requirements specified in 38.133 [6] clause 6.1.4.4.

7.3.3.1.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and supporting conditional handover.

7.3.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.3.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.3.1.

7.3.3.1.4   Test description

7.3.3.1.4.1   Initial conditions

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

This test shall be tested using any of the test configurations in Table 7.3.3.1.4.1-1.

Table 7.3.3.1.4.1-1: NR SA FR2 conditional handover test configurations

Config	Description
7.3.3.1-1	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
Note:	The UE is only required to be tested in one of the supported test configurations

Configure the test equipment and the DUT according to the parameters in Table 7.3.3.1.4.1-2

Table 7.3.3.1.4.1-2: Initial conditions for NR SA FR2 conditional handover

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.1.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1.   Message contents are defined in clause 7.3.3.1.4.3.

2.   The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR2 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.

3.   The test parameters are given in Table 7.3.3.1.4.1-3 below, with A3-Offset modified by Test Tolerance.

Table 7.3.3.1.4.1-3: General test parameters for NR SA FR2 conditional handover

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
A3-Offset for condition		dBm	-2[Note 1]	Trigger HO to cell which may be measured as -1dB relative to cell 1. Actual SS-RSRP is 5dB stronger.
Hysteresis		dB	0	
Time To Trigger		s	0	
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		s	≤2	
Note 1: Including test tolerance given in Annex F.1.3.2				

7.3.3.1.4.2   Test procedure

The test scenario comprises of 1 NR carrier and two cells, Cell 1 and Cell 2, on this carrier. General parameters and Cell-specific parameters for Cell 1 and Cell 2 are given in Table 7.3.3.1.4.1-3 and 7.3.3.1.5-1 respectively. No measurement gap is configured in the test case.

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 may not have any timing information of cell 2. The UE is configured with a condition implying handover to Cell 2 at a time earlier than T_{RRC} ms before the beginning of T2. No interruption shall be observed in time period T1. where,

-   T_{RRC} = 10ms, is the RRC procedure delay defined in clause 12 in TS 38.331 [13].

From start of T2, the Cell 2 becomes detectable and handover condition is satisfied. During T2, the UE performs measurement on Cell 2 and evaluates the execution condition, and starts handover procedure when execution condition is satisifed. The UE shall sent PRACH to Cell 2 less than $T_{measure} + T_{CHO\_execution} + T_{interrupt}$ ms from the start of T2. The Interruption length $T_{interrupt}$ shall also be verified in T2.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the *RRCReconfiguration* message. Cell 1 is the active cell. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 7.3.3.1.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts. The SS starts continuously scheduling the UE to perform DL reception in every DL slot on Cell 1 and monitoring corresponding ACK/NACK feedbacks sent by the UE.

3. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2).

4. The SS shall transmit an *RRCReconfiguration* message with *conditionalReconfiguration* on Cell 1 to configure CHO execution condition for the UE.

5. The UE shall transmit an *RRCReconfigurationComplete* message.

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.3.3.1.5-1. T2 starts.

7. If

    a) the UE transmits the PRACH preambles to Cell 2 less than $T_{measure} + T_{CHO\_execution} + T_{interrupt}$ ms from the beginning of time period T2,

    and

    b) no longer than X consecutive ACK/NACK DTXs are observed by the SS from the start of T2 to the instant the UE transmits the first PRACH preamble, where

        -   X = $8 \cdot T_{interrupt}$ for test configuration 7.3.3.1-1

    then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

8. After T2 expires, the SS sends an *RRCReconfiguration* with *reconfigurationWithSync* to cause UE handover back to Cell 1.

9. If UE is not in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1, switch off and on the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1.

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

7.3.3.1.4.3   Message contents

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

Table 7.3.3.1.4.3-1: RRCReconfiguration (Step 4)

Information Element	Value/remark	Comment	Condition
Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS and CHO			
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration SEQUENCE {			
measConfig	MeasConfig	Table 7.3.3.1.4.3-2	
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
conditionalReconfiguration-r16	ConditionalReconfiguration	Table 7.3.3.1.4.3-5	
}			
}			
}			
}			
}			
}			
}			

Table 7.3.3.1.4.3-2: MeasConfig (Table 7.3.3.1.4.3-1)

Information Element	Value/remark	Comment	Condition
Derivation Path: Table H.3.1-2			
MeasConfig ::= SEQUENCE {			
measObjectToAddModList SEQUENCE (SIZE (1..maxNrofObjectId)) OF MeasObjectToAddMod {	1 entry		
MeasObjectToAddMod[1] SEQUENCE {		entry 1	
measObjectId	1		
measObject CHOICE {			
measObjectNR	MeasObjectNR	Table 7.3.3.1.4.3-3	
}			
}			
}			
reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod {	1 entry		
ReportConfigToAddMod[1] SEQUENCE {		entry 1	
reportConfigId	1		
reportConfig CHOICE {			
reportConfigNR	ReportConfigNR	Table 7.3.3.1.4.3-4	
}			
}			
}			
measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasIdToAddMod {	1 entry		
MeasIdToAddMod[1] SEQUENCE {			
measId	1		
measObjectId	1		
reportConfigId	1		
}			
}			
quantityConfig	QuantityConfig specified in Table H.3.1-5		
}			

Table 7.3.3.1.4.3-3: MeasObjectNR (Table 7.3.3.1.4.3-2)

Derivation Path: TS 38.508-1[14], Table 4.6.3-76			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectNR ::= SEQUENCE {			
ssbFrequency	ARFCN-ValueNR for PCell		
smtc1	SSB-MTC specified in TS 38.508-1[14] Table 7.3.1-3 with condition SMTC.1		
referenceSignalConfig SEQUENCE {			
ssb-ConfigMobility SEQUENCE {			
ssb-ToMeasure	Not present		
}			
}			
absThreshSS-BlocksConsolidation	Not present		
}			

Table 7.3.3.1.4.3-4: ReportConfigNR (Table 7.3.3.1.4.3-2)

Derivation Path: TS 38.508-1[14], Table 4.6.3-142 with condition CHO			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR ::= SEQUENCE {			
reportType CHOICE {			
condTriggerConfig SEQUENCE {			
condEventId CHOICE {			
condEventA3 SEQUENCE {			
a3-Offset CHOICE {			
rsrp	-4	actuall value = -4*0.5 = -2dB	
}			
hysteresis	0	actuall value = 0*0.5 = 0dB	
timeToTrigger	ms0		
}			
}			
}			
}			
}			

Table 7.3.3.1.4.3-5: ConditionalReconfiguration (Table 7.3.3.1.4.3-1)

Information Element	Value/remark	Comment	Condition
Derivation Path: TS 38.508-1[14], Table 4.6.3-25D			
ConditionalReconfiguration-r16::= SEQUENCE {			
condReconfigToAddModList-r16 SEQUENCE (SIZE (1.. maxNrofCondCells-r16)) OF CondReconfigToAddMod-r16 {	1 entry		
CondReconfigToAddMod-r16 [1] SEQUENCE {		entry 1	
condReconfigId-r16	1		
condExecutionCond-r16 SEQUENCE (SIZE (1..2)) OF MeasId {	1 entry		
MeasId[1]	1	The MeasId configured in Table 7.3.3.1.4.3-2	
}			
condRRCReconfig-r16	OCTET STRING (CONTAINING RRCReconfiguration Specified in Table 4.8.1-1A with condition RBConfig_NoKeyChange)		
}			
}			
}			

7.3.3.1.5 Test requirements

Table 7.3.3.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.3.3.1.5-1: Cell specific test parameters for NR SA FR2 conditional handover

Parameter		Unit	Cell 1		Cell 2	
			T1	T2	T1	T2
NR RF Channel Number			1		1	
AoA setup			Setup 1 as defined in A.3.15			
Assumption for UE beams[Note 6]			Rough			
Duplex mode			TDD			
TDD configuration			TDDConf.3.1			
BW$_{channel}$		MHz	100: $N_{RB,c}$ = 66			
BWP BW		MHz	100: $N_{RB,c}$ = 66			
DRx Cycle		ms	Not Applicable			
PDSCH Reference measurement channel			SR3.1 TDD			
CORESET Reference Channel			CR3.1 TDD			
OCNG Patterns			OCNG pattern 1			
SMTC Configuration			SMTC pattern 1			
SSB Configuration			SSB.1 FR2			
PDSCH/PDCCH subcarrier spacing		kHz	120 kHz			
PUCCH/PUSCH subcarrier spacing		kHz	120 kHz			
PRACH configuration			FR2 PRACH configuration 1			
TRS configuration			TRS.2.1 TDD			
TCI configuration			CSI-RS.Config.0			
BWP configuration	Initial DL BWP		DLBWP.0.1			
	Dedicated DL BWP		DLBWP.1.1			
	Initial UL BWP		ULBWP.0.1			
	Dedicated UL BWP		ULBWP.1.1			
EPRE ratio of PSS to SSS		dB	0		0	
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
N_{oc} [Note2]		dBm/15kHz	-106.2 [Note 7]		-106.2 [Note 7]	
N_{oc} [Note2]	Config 1	dBm/SCS	-97.2		-97.2	
Ês/Iot$_{BB}$ [Note9]		dB	4.69	-5.44	-Infinity	3.73
$\hat{E}_s / N_{oc}$		dB	6	6	-Infinity	11
Io[Note3]	Config 1	dBm/ BW	-61.21	-55.73	-61.21	-55.73
Propagation condition		-	AWGN			

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

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

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

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: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

Note 7: Including test tolerance given in Annex F.1.3.2.

Note 8: Es/Iot, SSB_RP and Io levels have been derived from other parameters for infomation purposes. They are not settable parameters themseleves.

Note 9: Calculation of Es/Iot$_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated REFSENS requirement in TS 38.101-2 [3] clause 7.3.2, and an allowance of 1dB for UE multi-band relaxation factor Δ$_{MBS}$ specified in TS 38.101-2 [3] Table 6.2.1.3-4.

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

The test shall verify that there are no interruptions during T1.

The UE shall start to transmit the PRACH to Cell 2 less than $T_{measure} + T_{CHO\_execution} + T_{interrupt}$ from the start of T2. where:

- $T_{measure} = 1600$ ms for power class 1 UE and 1080ms for power class 2/3/4 UE, is the measurements time specified in 38.133 [6] clause 6.1.4.2.2.

- $T_{CHO\_execution} = 10$ ms, is the conditional execution preparation time specified in 38.133 [6] clause 6.1.4.2.2.

- $T_{interrupt} = T_{processing} + T_{IU} + T_\Delta + T_{margin}$ ms, is the interruption time specified in 38.133 [6] 6.1.4.2.4.

  - $T_{processing} = 20$ ms, is time for UE processing;

  - $T_{IU} = 20$ ms, is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell;

  - $T_\Delta = 20$ ms, is time for fine time tracking and acquiring full timing information of the target cell;

  - $T_{margin} = 2$ ms, is time for SSB post-processing.

This gives a total of 1672 ms for power class 1 UE and 1152 ms for power class 2/3/4 UE.
The interruption during T2 shall not exceeed $T_{interrupt} = 62$ms.

7.3.3.2 NR SA FR2-FR2 conditional handover

Editor's Note: This test case is incomplete in following aspects:

- TT analysis is missing.

- Some test parameters are still FFS

7.3.3.2.1 Test purpose

To verify the requirement for the NR FR2 inter-frequency conditional handover requirements specified in 38.133 [6] clause 6.1.4.4.

7.3.3.2.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and supporting conditional handover.

7.3.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.3.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.3.3.2.

7.3.3.2.4 Test description

7.3.3.2.4.1 Initial conditions

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

This test shall be tested using any of the test configurations in Table 7.3.3.2.4.1-1.

Table 7.3.3.2.4.1-1: NR SA FR2-FR2 conditional handover test configurations

Config	Description
7.3.3.2-1	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
Note:	The UE is only required to be tested in one of the supported test configurations

Configure the test equipment and the DUT according to the parameters in Table 7.3.3.2.4.1-2

Table 7.3.3.2.4.1-2: Initial conditions for NR SA FR2-FR2 conditional handover

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.1.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.3.4.1	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 7.3.3.2.4.3.

2. The power levels and settings for NR Cell 1 are set according to Annex C.1.2 and C.1.3. Cell 2 is NR FR2 target Cell, and its power levels and settings are also set according to Annex C.1.2 and C.1.3.

3. The test parameters are given in Table 7.3.3.2.4.1-3 below, with A3-Offset modified by Test Tolerance.

Table 7.3.3.2.4.1-3: General test parameters for NR SA FR2-FR2 conditional handover

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
A3-Offset for handover condition		dB	FFS	
Hysteresis		dB	0	
Time To Trigger		s	0	
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		s	≤7	

7.3.3.2.4.2   Test procedure

The test scenario comprises of 2 NR carriers and two cells, Cell 1 and Cell 2, on each carrier respectively. General parameters and Cell-specific parameters for Cell 1 and Cell 2 are given in Table 7.3.3.2.4.1-3 and 7.3.3.2.5-1 respectively. Measurement gap (gap pattern #0) is configured in the test case.

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 may not have any timing information of cell 2. The UE is configured with a condition implying handover to Cell 2 at a time earlier than T_{RRC} ms before the beginning of T2. No interruption shall be observed in time period T1. where,

-    T_{RRC} = 10ms, is the RRC procedure delay defined in clause 12 in TS 38.331 [13].

From start of T2, the Cell 2 becomes detectable and handover condition is satisfied. During T2, the UE performs measurement on Cell 2 and evaluates the execution condition, and starts handover procedure when execution condition is satisifed. The UE shall sent PRACH to Cell 2 less than $T_{measure} + T_{CHO\_execution} + T_{interrupt}$ ms from the start of T2. The Interruption length $T_{interrupt}$ shall also be verified in T2.

1. Ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the *RRCReconfiguration* message. Cell 1 is the active cell. Set Cell 2 physical cell identity to the initial physical cell identity.

2. Set the parameters according to T1 in Table 7.3.3.2.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts. The SS starts continuously scheduling the UE to perform DL reception in every DL slot on Cell 1 and monitoring corresponding ACK/NACK feedbacks sent by the UE.

3. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 14 + 2).

4. The SS shall transmit an *RRCReconfiguration* message with *conditionalReconfiguration* on Cell 1 to configure CHO execution condition and measurement gap pattern #0 for the UE.

5. The UE shall transmit an *RRCReconfigurationComplete* message.

6. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.3.3.2.5-1. T2 starts.

7. If

   c)   the UE transmits the PRACH preambles to Cell 2 less than $T_{measure} + T_{CHO\_execution} + T_{interrupt}$ ms from the beginning of time period T2,

   and

   d)   no longer than X consecutive ACK/NACK DTXs are observed by the SS from the start of T2 to the instant the UE transmits the first PRACH preamble, where

      -   $X = 8 \cdot T_{interrupt}$ for test configuration 7.3.3.2-1

   then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

8. After T2 expires, the SS sends an *RRCReconfiguration* with *reconfigurationWithSync* to cause UE handover back to Cell 1.

9. If UE is not in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1, switch off and on the UE. Then ensure the UE is in State RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1.

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

7.3.3.2.4.3   Message contents

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

Table 7.3.3.2.4.3-1: RRCReconfiguration (Step 4)

Information Element	Value/remark	Comment	Condition
Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS and CHO			
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration SEQUENCE {			
measConfig	MeasConfig	Table 7.3.3.2.4.3-2	
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
conditionalReconfiguration-r16	ConditionalReconfiguration	Table 7.3.3.2.4.3-6	
}			
}			
}			
}			
}			
}			
}			

Table 7.3.3.2.4.3-2: MeasConfig (Table 7.3.3.2.4.3-1)

Information Element	Value/remark	Comment	Condition
Derivation Path: Table H.3.1-2			
MeasConfig ::= SEQUENCE {			
measObjectToAddModList SEQUENCE (SIZE (1..maxNrofObjectId)) OF MeasObjectToAddMod {	2 entry		
MeasObjectToAddMod[1] SEQUENCE {		entry 1	
measObjectId	1		
measObject CHOICE {			
measObjectNR	MeasObjectNR-f1	Table 7.3.3.2.4.3-3	
}			
}			
MeasObjectToAddMod[2] SEQUENCE {		entry 2	
measObjectId	2		
measObject CHOICE {			
measObjectNR	MeasObjectNR-f2	Table 7.3.3.2.4.3-4	
}			
}			
}			
reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod {	1 entry		
ReportConfigToAddMod[1] SEQUENCE {		entry 1	
reportConfigId	1		
reportConfig CHOICE {			
reportConfigNR	ReportConfigNR	Table 7.3.3.2.4.3-5	
}			
}			
}			
measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasIdToAddMod {	1 entry		
MeasIdToAddMod[1] SEQUENCE {			
measId	1		
measObjectId	2		
reportConfigId	1		
}			
}			
measGapConfig	MeasGapConfig specified in Table H.3.1-6 with condition gapUE and Pattern #0		
quantityConfig	QuantityConfig specified in Table H.3.1-5		
}			

Table 7.3.3.2.4.3-3: MeasObjectNR-f1 (Table 7.3.3.2.4.3-2)

Derivation Path: TS 38.508-1[14], Table 4.6.3-76			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectNR ::= SEQUENCE {			
ssbFrequency	ARFCN-ValueNR for Cell 1		
smtc1	SSB-MTC specified in TS 38.508-1[14] Table 7.3.1-3 with condition SMTC.1		
referenceSignalConfig SEQUENCE {			
ssb-ConfigMobility SEQUENCE {			
ssb-ToMeasure	Not present		
}			
}			
absThreshSS-BlocksConsolidation	Not present		
}			

Table 7.3.3.2.4.3-4: MeasObjectNR-f2 (Table 7.3.3.2.4.3-2)

Derivation Path: TS 38.508-1[14], Table 4.6.3-76			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectNR ::= SEQUENCE {			
ssbFrequency	ARFCN-ValueNR for Cell 2		
smtc1	SSB-MTC specified in TS 38.508-1[14] Table 7.3.1-3 with condition SMTC.1		
referenceSignalConfig SEQUENCE {			
ssb-ConfigMobility SEQUENCE {			
ssb-ToMeasure	Not present		
}			
}			
absThreshSS-BlocksConsolidation	Not present		
}			

Table 7.3.3.2.4.3-5: ReportConfigNR (Table 7.3.3.2.4.3-2)

Derivation Path: TS 38.508-1[14], Table 4.6.3-142 with condition CHO			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR ::= SEQUENCE {			
reportType CHOICE {			
condTriggerConfig SEQUENCE {			
condEventId CHOICE {			
condEventA3 SEQUENCE {			
a3-Offset CHOICE {			
rsrp	FFS		
}			
hysteresis	0	actuall value = 0*0.5 = 0dB	
timeToTrigger	ms0		
}			
}			
}			
}			
}			

Table 7.3.3.2.4.3-6: ConditionalReconfiguration (Table 7.3.3.2.4.3-1)

Information Element	Value/remark	Comment	Condition
Derivation Path: TS 38.508-1[14], Table 4.6.3-25D			
ConditionalReconfiguration-r16::= SEQUENCE {			
condReconfigToAddModList-r16 SEQUENCE (SIZE (1.. maxNrofCondCells-r16)) OF CondReconfigToAddMod-r16 {	1 entry		
CondReconfigToAddMod-r16 [1] SEQUENCE {		entry 1	
condReconfigId-r16	1		
condExecutionCond-r16 SEQUENCE (SIZE (1..2)) OF MeasId {	1 entry		
MeasId[1]	1	The MeasId configured in Table 7.3.3.2.4.3-2	
}			
condRRCReconfig-r16	OCTET STRING (CONTAINING RRCReconfiguration Specified in Table 4.8.1-1A with condition RBConfig_NoKeyChange)		
}			
}			
}			

7.3.3.2.5 Test requirements

Table 7.3.3.2.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.3.3.2.5-1: Cell specific test parameters for NR SA FR2-FR2 conditional handover

Parameter		Unit	Cell 1		Cell 2	
			T1	T2	T1	T2
NR RF Channel Number			1		2	
AoA setup			Setup 1 as defined in A.3.15			
Assumption for UE beams[Note 6]			Rough			
Duplex mode			TDD			
TDD configuration			TDDConf.3.1			
$BW_{channel}$		MHz	100: $N_{RB,c}$ = 66			
BWP BW		MHz	100: $N_{RB,c}$ = 66			
DRx Cycle		ms	Not Applicable			
Gap pattern ID			gp0			
PDSCH Reference measurement channel			SR3.1 TDD			
CORESET Reference Channel			CR3.1 TDD			
OCNG Patterns			OCNG pattern 1			
SMTC Configuration			SMTC pattern 1			
SSB Configuration			SSB.1 FR2			
PDSCH/PDCCH subcarrier spacing		kHz	120 kHz			
PUCCH/PUSCH subcarrier spacing		kHz	120 kHz			
PRACH configuration			FR2 PRACH configuration 1			
TRS configuration			TRS.2.1 TDD			
TCI configuration			CSI-RS.Config.0			
BWP configuration	Initial DL BWP		DLBWP.0.1			
	Dedicated DL BWP		DLBWP.1.1			
	Initial UL BWP		ULBWP.0.1			
	Dedicated UL BWP		ULBWP.1.1			
EPRE ratio of PSS to SSS		dB	0		0	
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
N_{oc} [Note2]		dBm/15kHz	-104.7		-104.7	
N_{oc} [Note2]	Config 1,2	dBm/SCS	-95.7		-95.7	
	Config 3		-95.7		-95.7	
$\hat{E}_s/I_{ot}$		dB	5	5	-Infinity	5
$\hat{E}_s/N_{oc}$		dB	5	5	-Infinity	5
Io[Note3]	Config 1,2	dBm/BW	-60.5	-60.5	-66.7	-60.5
	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_{oc} to be fulfilled.						
Note 3: Io 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						
Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation						

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

The test shall verify that there are no interruptions during T1.

The UE shall start to transmit the PRACH to Cell 2 less than $T_{measure} + T_{CHO\_execution} + T_{interrupt}$ from the start of T2. where:

-    $T_{measure} = 6720$ ms for power class 1 UE and 4160 ms for power class 2/3/4 UE, is the measurements time specified in 38.133 [6] clause 6.1.4.2.2.

-    $T_{CHO\_execution} = 10$ ms, is the conditional execution preparation time specified in 38.133 [6] clause 6.1.4.2.2.

-    $T_{interrupt} = T_{processing} + T_{IU} + T_{\Delta} + T_{margin}$ ms, is the interruption time specified in 38.133 [6] 6.1.4.2.4.

  - $T_{processing} = 20$ ms, is time for UE processing;

  - $T_{IU} = 20$ ms, is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell;

  - $T_{\Delta} = 20$ ms, is time for fine time tracking and acquiring full timing information of the target cell;

  - $T_{margin} = 2$ ms, is time for SSB post-processing.

This gives a total of 6792 ms for power class 1 UE and 4232 ms for power class 2/3/4 UE.

The interruption during T2 shall not exceeed $T_{interrupt} = 62$ms.

7.4   Timing

7.4.1   UE transmit timing

7.4.2   UE timer accuracy

7.4.3   Timing advance

7.5   Signalling characteristics

7.5.1   Radio link monitoring

7.5.1.0   Minimum conformance requirements

7.5.1.0.1

7.5.1.0.2

7.5.1.0.3

7.5.1.0.4

7.5.1.0.5   Minimum conformance requirements for UE scheduling restrictions during radio link monitoring

[TS 38.133, clause 8.1.7.3]

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.

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.

7.5.1.1 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

7.5.1.1.1 Test purpose

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 TS 38.133 [6] clause 8.1.

7.5.1.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards supporting 5GS NR SA FR2.

7.5.1.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.5.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.1.1.

7.5.1.1.4 Test description

In the test, UE is configured to perform RLM on SSB, with detectionResource included in RadioLinkMonitoringRS set to SSB#0 and SSB#1, and purpose set to 'rlf'. Supported test configurations are shown in table 7.5.1.1.4.1-1. The test parameters are given in Tables 7.5.1.1.4.1-3, 7.5.1.1.5-1, and 7.5.1.1.5-2 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 7.5.1.1.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states, and Figure 7.5.1.1.4-2 shows the Time multiplexed downlink transmissions from each Angle of Arrival. 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 addition to RLM-RS radio link monitoring using SSB index 0 and SSB index 1, the UE is configured to perform inter-frequency measurements using Gap Pattern ID #0 (40ms) in test 1.
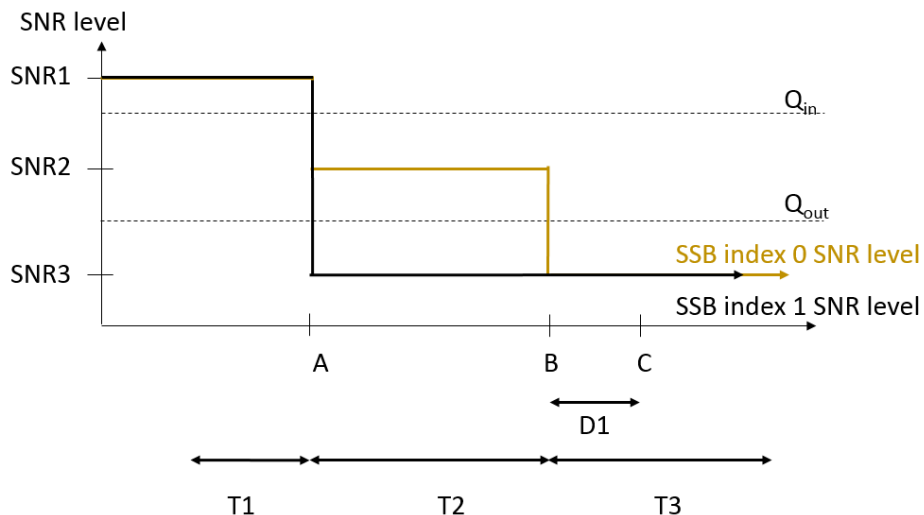
Figure 7.5.1.1.4-1: SNR variation for out-of-sync testing
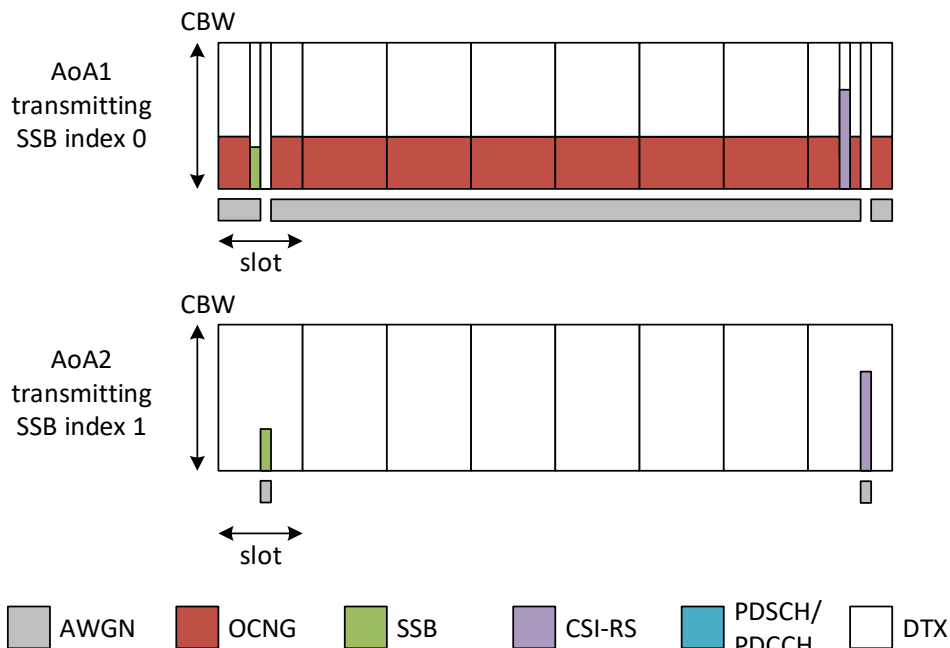
Figure 7.5.1.1.4-2: Time multiplexed downlink transmissions

7.5.1.1.4.1 Initial conditions

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

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1 of 38.521-2 [18].

This test shall be tested using any of the test configurations in Table 7.5.1.1.4.1-1.

Table 7.5.1.1.4.1-1: Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode supported test configurations for FR2 PCell

Configuration	Description
7.5.1.1-1	TDD, SSB SCS 120 KHz, data SCS 120KHz, BW 100 MHz

Configure the test equipment and the DUT according to the parameters in Table 7.5.1.1.4.1-2

Table 7.5.1.1.4.1-2: Initial conditions for Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.2, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.5.1.1.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.3.4.1	
Exceptions to connection diagram	N/A		

1.   The test parameters for PCell are given in Table 7.5.1.1.4.1-3

2.   Message contents are defined in clause 7.5.1.1.4.3.

3.   There is one carrier and one cell specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.5.1.1.4.1-3: General test parameters for FR2 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
BW$_{channel}$	Config 1		100: N$_{RB,c}$ = 66
Data RBs allocated	Config 1		24
DL initial BWP configuration	Config 1		DLBWP.0.1
DL dedicated BWP configuration	Config 1		DLBWP.1.1
UL initial BWP configuration	Config 1		ULBWP.0.1
UL dedicated BWP configuration	Config 1		ULBWP.1.1
TDD Configuration	Config 1		TDDConf.3.1
RMSI CORESET Reference Channel	Config 1		CR.3.1 TDD
Dedicated CORESET Reference Channel	Config 1		CCR.3.4 TDD
SSB Configuration	Config 1		SSB.1 FR2
SMTC Configuration	Config 1		SMTC.1
PDSCH/PDCCH subcarrier spacing	Config 1		120 KHz
PRACH Configuration	Config 1		PRACH.4 FR2
SSB index assigned as RLM RS	Config 1		0,1
OCNG parameters			OP.5
CP length			Normal
Out of sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			*OFF*
Gap pattern ID			*gp0*
Layer 3 filtering			*Enabled*
T310 timer		ms	*0*
T311 timer		ms	1000
N310			1
N311			1
CSI-RS for CSI reporting	Config 1		CSI-RS.3.1 TDD
reportConfigType			periodic
reportQuantity			cri-RI-PMI-CQI
CSI reporting periodicity		slot	40
CSI reporting offset		slot	4
TCI states for PDCCH/PDSCH			TCI.State.2
CSI-RS for tracking	Config 1		TRS.2.1 TDD
T1		s	0.2
T2		s	9.68
T3		s	9.68
D1		s	9.64
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.			

7.5.1.1.4.2   Test Procedure

There is one cell (Cell 1), which is the active NR cell, in the test. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 (PCell). The UE shall be configured for periodic CQI reporting in PUCCH [format 1] with a reporting periodicity as mentioned in the above table 7.5.1.1.4.1-3.

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

2. Set the parameters according to T1 in Table 7.5.1.1.5-1. Propagation conditions are set according to Annex C.2.2. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.1.1.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.1.1.5-1. T3 starts.

5. If the SS:

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

and

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

   the number of successful tests is increased by one.

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

7. When T3 expires the SS shall change the SNR value to T1 as specified in Table 7.5.1.1.5-1.

8. If the UE has not re-established the connection in at least 1s, the SS shall transmit [FFS] according to [FFS] to add NR cell (PCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

9. If the Reconfiguration fails, switch off and on the UE and ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

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

7.5.1.1.4.3 Message Contents

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

Table 7.5.1.1.4.3-1: Common Exception messages for Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier centre of Adjacent range) Table H.3.1-4 with A3-offset = 0 Table H.3.1-6 with Condition RLM Table H.3.1-7 Table H.3.5-4 Table H.3.5-9 with Condition SSB RLM Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 7.5.1.1.4.3-1: PDCCH Search Space

Derivation Path: TS 38.508-1 [14], Table 4.6.3-162			
Information Element	**Value/remark**	**Comment**	**Condition**
SearchSpace ::= SEQUENCE {			
monitoringSlotPeriodicityAndOffset CHOICE {			
sl1	NULL		
}			
Duration	2		
monitoringSymbolsWithinSlot	11000000000000	Symbols 0 and 1	
nrofCandidates SEQUENCE {			
aggregationLevel1	n0		
aggregationLevel2	n0		
aggregationLevel4	n0		
aggregationLevel8	n1	AL8	
aggregationLevel16	n0		
}			
searchSpaceType CHOICE {			
common SEQUENCE {			CSS, SISS
ue-Specific SEQUENCE {			USS
dci-Formats	formats0-0-And-1-0	DCI Format 1_0	
}			
}			
}			

Table 7.5.1.1.4.3-2: UE-TimersAndConstants

Derivation Path: TS 38.508-1 [14], Table 4.6.3-200			
Information Element	**Value/remark**	**Comment**	**Condition**
UE-TimersAndConstants ::= SEQUENCE {			
t310	ms0		
n310	n1		
t311	ms1000		
n311	n1		
}			

Table 7.5.1.1.4.3-3: CSI-FrequencyOccupation

Derivation Path: TS 38.508-1 [14], Table 4.6.3-33			
Information Element	**Value/remark**	**Comment**	**Condition**
CSI-FrequencyOccupation ::= SEQUENCE {			
startingRB	0		
nrofRBs	66	100 MHz (120 KHz SCS)	
}			

7.5.1.1.5 Test Requirement

Table 7.5.1.1.4.1-3 and 7.5.1.1.5-1 define the primary level settings including test tolerances for Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode.

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%.

Table 7.5.1.1.5-1: 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	T3	T1	T2	T3
AoA setup			Setup 3 defined in A.9.3					
			AoA1			AoA2		
Assumption for UE beams Note 5			Rough			Rough		
EPRE ratio of PDCCH DMRS to SSS		dB	4			Not sent		
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						
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						
ssb-Index 0 SNR	Config 1	dB	4.1[Note 6]	-3.9[Note 6]	-15			
ssb-Index 1 SNR	Config 1		Not sent			4.1[Note 6]	-15	-15
N_{oc}	Config 1	dBm/15kHz	-94.8			-94.8		
Time multiplexing of the downlink transmissions from each AoA			Defined in Figure 7.5.1.1.4-2					
Propagation condition			TDL-A 30ns 75Hz			TDL-A 30ns 75Hz		
Note 1: OCNG shall be used such 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 38.133 [6] A.3.6.								
Note 5: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.								
Note 6: This value allows up to 1dB degradation from applied SNR to UE baseband								

Table 7.5.1.1.5-2: Measurement gap configuration for out-of-sync tests in non-DRX mode

Field	Test 1
	Value
gapOffset	0

7.5.1.2 Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode

Editor's Note: This test case has been completed for the following configurations:

   - Test frequency f ≤ 40.8 GHz

   - UE PC3

   - Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

7.5.1.2.1 Test purpose

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 TS 38.133 [6] clause 8.1.

7.5.1.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards supporting 5GS NR SA FR2.

7.5.1.2.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.5.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.1.2.

7.5.1.2.4 Test description

In the test, UE is configured to perform RLM on SSB, with detectionResource included in RadioLinkMonitoringRS set to SSB#0 and SSB#1, and purpose set to 'rlf'. Supported test configurations are shown in table 7.5.1.2.4-1. The test parameters are given in Tables 7.5.1.2.4.1-3 and 7.5.1.2.5-1 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 7.5.1.2.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states, and Figure 7.5.1.2.4-2 shows the Time multiplexed downlink transmissions from each Angle of Arrival. 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.
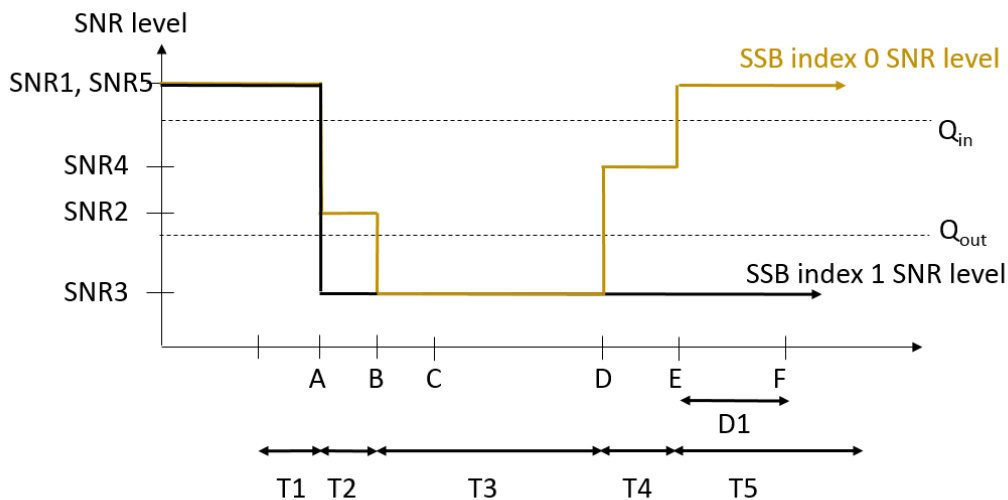
Figure 7.5.1.2.4-1: SNR variation for in-sync testing
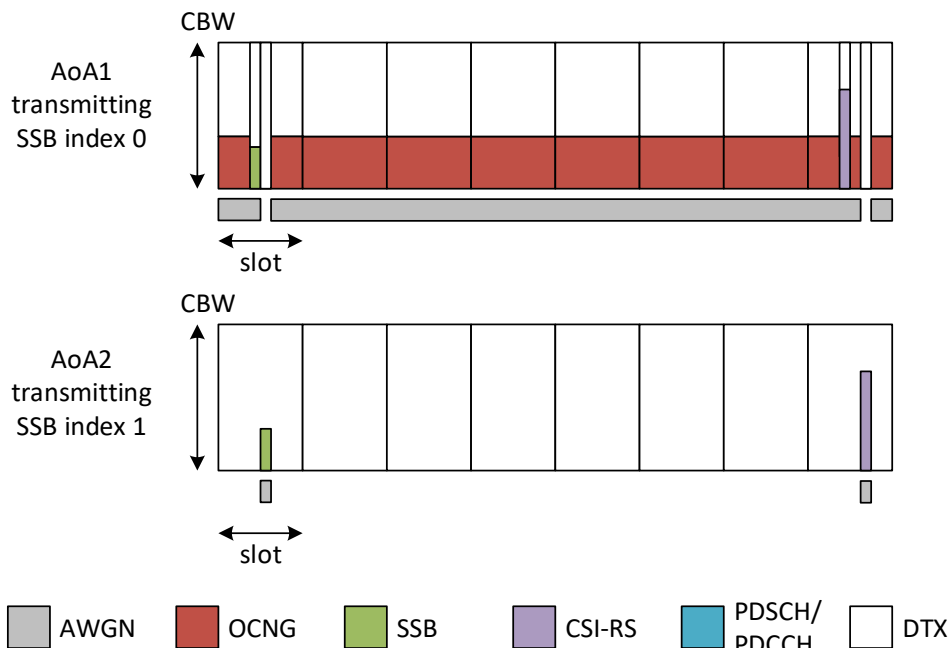
Figure 7.5.1.2.4-2: Time multiplexed downlink transmissions

7.5.1.2.4.1 Initial conditions

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

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1 of 38.521-2 [18].

This test shall be tested using any of the test configurations in Table 7.5.1.2.4.1-1.

Table 7.5.1.2.1-1: Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode supported test configurations for FR2 PCell

Configuration	Description
7.5.1.2-1	TDD, SSB SCS 120 KHz, data SCS 120KHz, BW 100 MHz

Configure the test equipment and the DUT according to the parameters in Table 7.5.1.2.4.1-2

Table 7.5.1.2.4.1-2: Initial conditions for Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.2, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.5.1.2.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.3.4.1	
Exceptions to connection diagram	N/A		

1. The test parameters for PCell are given in Table 7.5.1.2.4.1-3

2.   Message contents are defined in clause 7.5.1.2.4.3.

3.   There is one carrier and one cell specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.5.1.2.4.1-3: General test parameters for FR2 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
BW$_{channel}$	Config 1		100: N$_{RB,c}$ = 66
Data RBs allocated	Config 1		24
DL initial BWP configuration	Config 1		DLBWP.0.1
DL dedicated BWP configuration	Config 1		DLBWP.1.1
UL initial BWP configuration	Config 1		ULBWP.0.1
UL dedicated BWP configuration	Config 1		ULBWP.1.1
TDD Configuration	Config 1		TDDConf.3.1
RMSI CORESET Reference Channel	Config 1		CR.3.1 TDD
Dedicated CORESET Reference Channel	Config 1		CCR.3.1 TDD
SSB Configuration	Config 1		SSB.1 FR2
SMTC Configuration	Config 1		SMTC.3
PDSCH/PDCCH subcarrier spacing	Config 1		120 KHz
PRACH Configuration	Config 1		PRACH.4 FR2
SSB index assigned as RLM RS	Config 1		0,1
OCNG parameters			OP.5
CP length			Normal
In sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	4
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	0
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	0
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
Out of sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			*OFF*
Gap pattern ID			N.A.
Layer 3 filtering			*Enabled*
T310 timer		ms	4000
T311 timer		ms	1000
N310			1
N311			1
CSI-RS for CSI reporting	Config 1		CSI-RS.3.1 TDD
reportConfigType			periodic
reportQuantity			cri-RI-PMI-CQI
CSI reporting periodicity		slot	40
CSI reporting offset		slot	4
TCI states for PDCCH/PDSCH			TCI.State.2
CSI-RS for tracking	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: 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.		

7.5.1.2.4.2 Test Procedure

Editor's Note: Test procedure updates to ensure accurate FR2 test measurement state is TBD

There is one cell (Cell 1), which is the active NR cell, in the test. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 (PCell). The UE shall be configured for periodic CQI reporting in PUCCH [format 1] with a reporting periodicity as mentioned in the above table 7.5.1.2.4.1-3.

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

2. Set the parameters according to T1 in Table 7.5.1.2.5-1. Propagation conditions are set according to Annex C.2.2. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.1.2.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.1.2.5-1. T3 starts.

5. When T3 expires, the SS shall change the SNR value to T4 as specified in Table 7.5.1.2.5-1. T4 starts.

6. When T4 expires, the SS shall change the SNR value to T5 as specified in Table 7.5.1.2.5-1. T5 starts.

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

   Otherwise the number of failed tests is increased by one.

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

7.5.1.2.4.3 Message Contents

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

Table 7.5.1.2.4.3-1: Common Exception messages for Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier centre of Adjacent range) Table H.3.1-4 with A3-offset = 0 Table H.3.1-6 with Condition RLM Table H.3.1-7 Table H.3.5-4 Table H.3.5-9 with Condition SSB RLM Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.3

Table 7.5.1.2.4.3-2: PDCCH Search Space

Derivation Path: TS 38.508-1 [14], Table 4.6.3-162			
Information Element	**Value/remark**	**Comment**	**Condition**
SearchSpace ::= SEQUENCE {			
monitoringSlotPeriodicityAndOffset CHOICE {			
sl1	NULL		
}			
duration	2		
monitoringSymbolsWithinSlot	11000000000000	Symbols 0 and 1	
nrofCandidates SEQUENCE {			
aggregationLevel1	n0		
aggregationLevel2	n0		
aggregationLevel4	n0		
aggregationLevel8	n1	AL8	
aggregationLevel16	n0		
}			
searchSpaceType CHOICE {			
ue-Specific SEQUENCE {			USS
dci-Formats	formats0-0-And-1-0	DCI Format 1_0	
}			
}			
}			

Table 7.5.1.2.4.3-3: *RLF-TimersAndConstant*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	**Value/remark**	**Comment**	**Condition**
RLF-TimersAndConstants ::= SEQUENCE {			
t310	ms4000		
n310	n1		
n311	n1		
t311-v1530	ms1000		
}			

Table 7.5.1.2.4.3-4: CSI-FrequencyOccupation

Derivation Path: TS 38.508-1 [14], Table 4.6.3-33			
Information Element	**Value/remark**	**Comment**	**Condition**
CSI-FrequencyOccupation ::= SEQUENCE {			
startingRB	0		
nrofRBs	66	100 MHz (120 KHz SCS)	
}			

7.5.1.2.5 Test Requirement

Table 7.5.1.2.4.1-3 and 7.5.1.2.5-1 define the primary level settings including test tolerances for Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in non-DRX mode.

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

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

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

Table 7.5.1.2.5-1: OTA related cell specific test parameters for FR2 (Cell 1) for in-sync radio link monitoring tests in non-DRX mode

Parameter		Unit	Test 1									
			T1	T2	T3	T4	T5	T1	T2	T3	T4	T5
AoA setup			Setup 3 defined in A.9.3									
			AoA1					AoA2				
Assumption for UE beams Note 5			Rough					Rough				
EPRE ratio of PDCCH DMRS to SSS		dB	0					Not sent				
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										
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										
ssb-Index 0 SNR	Config 1	dB	4.1$^{Note 6}$	-3.9$^{Note 6}$	-15	-4.5	4.1$^{Note 6}$					
ssb-Index 1 SNR	Config 1		Not sent					4.1$^{Note 6}$	-15	-15	-15	-15
N_{oc}	Config 1	dBm/ 15kHz	-94.8					-94.8				
Time multiplexing of the downlink transmissions from each AoA			Defined in Figure 7.5.1.2.4-2									
Propagation condition			TDL-A 30ns 75Hz					TDL-A 30ns 75Hz				

Note 1:   OCNG shall be used such that 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 38.133 [6] A.3.6.
Note 5:   Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.
Note 6:   This value allows up to 1dB degradation from applied SNR to UE baseband

7.5.1.3 Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

7.5.1.3.1 Test purpose

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 TS 38.133 [6] clause 8.1.

7.5.1.3.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards supporting 5GS NR SA FR2 and long DRX cycle.

7.5.1.3.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.5.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause 7.5.1.3.

7.5.1.3.4 Test description

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0 and SSB#1, and *purpose* set to '*rlf*'. Supported test configurations are shown in table 7.5.1.3.4.1-1. The test parameters are given in Tables 7.5.1.3.4.1-3 and 7.5.1.3.5-1 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 7.5.1.3.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.
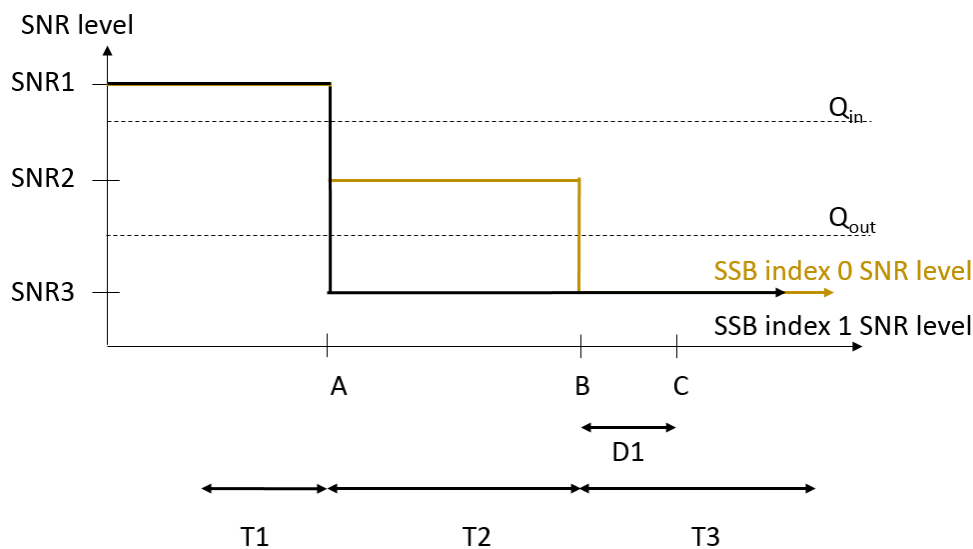
Figure 7.5.1.3.4-1: SNR variation for out-of-sync testing

7.5.1.3.4.1 Initial conditions

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

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1 of 38.521-2 [18].

This test shall be tested using any of the test configurations in Table 7.5.1.3.4.1-1.

Table 7.5.1.3.4.1-1: Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode supported test configurations for FR2 PCell

Configuration	Description
7.5.1.3-1	TDD, SSB SCS 120 KHz, data SCS 120KHz, BW 100 MHz

Configure the test equipment and the DUT according to the parameters in Table 7.5.1.3.4.1-2

Table 7.5.1.3.4.1-2: Initial conditions for Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.2, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.5.1.3.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.3.4.1	
Exceptions to connection diagram	N/A		

1.   The test parameters for PCell are given in Table 7.5.1.3.4.1-3

2.   Message contents are defined in clause 7.5.1.3.4.3.

3.   There is one carrier and one cell specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.5.1.3.4.1-3: General test parameters for FR2 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
BW$_{channel}$	Config 1		100: N$_{RB,c}$ = 66
Data RBs allocated	Config 1		66
DL initial BWP configuration	Config 1		DLBWP.0.1
DL dedicated BWP configuration	Config 1		DLBWP.1.1
UL initial BWP configuration	Config 1		ULBWP.0.1
UL dedicated BWP configuration	Config 1		ULBWP.1.1
TDD Configuration	Config 1		TDDConf.3.1
RMSI CORESET Reference Channel	Config 1		CR.3.1 TDD
Dedicated CORESET Reference Channel	Config 1		CCR.3.4 TDD
SSB Configuration	Config 1		SSB.1 FR2
SMTC Configuration	Config 1		SMTC.1
PDSCH/PDCCH subcarrier spacing	Config 1		120 KHz
PRACH Configuration	Config 1		PRACH.4 FR2
SSB index assigned as RLM RS	Config 1		0,1
OCNG parameters			OP.1
CP length			Normal
Out of sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX Configuration			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 reporting	Config 1		CSI-RS.3.1 TDD
reportConfigType			periodic
reportQuantity			cri-RI-PMI-CQI
CSI reporting periodicity		slot	40
CSI reporting offset		slot	4
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
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.			

7.5.1.3.4.2 Test Procedure

There is one cell (Cell 1), which is the active NR cell, in the test. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 (PCell). The UE shall be configured for periodic CQI reporting in PUCCH [format 1] with a reporting periodicity as mentioned in the above table 7.5.1.3.4.1-3.

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

2. Set the parameters according to T1 in Table 7.5.1.3.5-1. Propagation conditions are set according to Annex C.2.2. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.1.3.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.1.3.5-1. T3 starts.

5. If the SS:

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

and

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

   the number of successful tests is increased by one.

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

7. When T3 expires the SS shall change the SNR value to T1 as specified in Table 7.5.1.3.5-1.

8. If the UE has not re-established the connection in at least 1s, the SS shall transmit [FFS] according to [FFS] to add NR cell (PCell). The UE shall transmit RRCConnectionReconfigurationComplete message.

9. If the Reconfiguration fails, switch off and on the UE and ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

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

7.5.1.3.4.3 Message Contents

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

Table 7.5.1.3.4.3-1: Common Exception messages for Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED Table H.3.1-7 Table H.3.5-4 Table H.3.5-9 with Condition SSB RLM Table H.3.7-1 with condition DRX.3 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 7.5.1.3.4.3-1: PDCCH Search Space

Derivation Path: TS 38.508-1 [14], Table 4.6.3-162			
Information Element	**Value/remark**	**Comment**	**Condition**
SearchSpace ::= SEQUENCE {			
monitoringSlotPeriodicityAndOffset CHOICE {			
sl1	NULL		
}			
Duration	2		
monitoringSymbolsWithinSlot	11000000000000	Symbols 0 and 1	
nrofCandidates SEQUENCE {			
aggregationLevel1	n0		
aggregationLevel2	n0		
aggregationLevel4	n0		
aggregationLevel8	n1	AL8	
aggregationLevel16	n0		
}			
searchSpaceType CHOICE {			
common SEQUENCE {			CSS, SISS
ue-Specific SEQUENCE {			USS
dci-Formats	formats0-0-And-1-0	DCI Format 1_0	
}			
}			
}			

Table 7.5.1.3.4.3-2: UE-TimersAndConstants

Derivation Path: TS 38.508-1 [14], Table 4.6.3-200			
Information Element	**Value/remark**	**Comment**	**Condition**
UE-TimersAndConstants ::= SEQUENCE {			
t310	ms0		
n310	n1		
t311	ms1000		
n311	n1		
}			

Table 7.5.1.3.4.3-3: CSI-FrequencyOccupation

Derivation Path: TS 38.508-1 [14], Table 4.6.3-33			
Information Element	**Value/remark**	**Comment**	**Condition**
CSI-FrequencyOccupation ::= SEQUENCE {			
startingRB	0		
nrofRBs	66	100 MHz (120 KHz SCS)	
}			

7.5.1.3.5   Test Requirement

Table 7.5.1.3.4.1-3 and 7.5.1.3.5-1 define the primary level settings including test tolerances for Radio Link Monitoring Out-of-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode.

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%.

Table 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

Parameter		Unit	Test 1		
			T1	T2	T3
AoA setup			Setup 1 defined in A.9.1		
Assumption for UE beams Note 5			Rough		
EPRE ratio of PDCCH DMRS to SSS		dB	4		
EPRE ratio of PDCCH to PDCCH DMRS		dB	0		
EPRE ratio of PBCH DMRS to SSS		dB	0		
EPRE ratio of PBCH to PBCH DMRS		dB			
EPRE ratio of PSS to SSS		dB			
EPRE ratio of PDSCH DMRS to SSS		dB			
EPRE ratio of PDSCH to PDSCH DMRS		dB			
EPRE ratio of OCNG DMRS to SSS		dB			
EPRE ratio of OCNG to OCNG DMRS		dB			
ssb-Index 0 SNR	Config 1	dB	3.3[Note 6]	-4.7[Note 6]	-15.4
ssb-Index 1 SNR	Config 1		3.3[Note 6]	-15.4	-15.4
N_{oc}	Config 1	dBm/15KHz	-104.7dBm		
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 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.
Note 5: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.
Note 6: This value allows up to 1dB degradation from applied SNR to UE baseband.

7.5.1.4 Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

7.5.1.4.1 Test purpose

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 TS 38.133 [6] clause 8.1.

7.5.1.4.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards supporting 5GS NR SA FR2 and long DRX cycle.

7.5.1.4.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.5.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause 7.5.1.4.

7.5.1.4.4 Test description

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0 and SSB#1, and *purpose* set to '*rlf*'. Supported test configurations are shown in table A.7.5.1.4.1-1. The test parameters are given in Tables 7.5.1.4.4.1-3 and 7.5.1.4.5-1 below. 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 7.5.1.4.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.
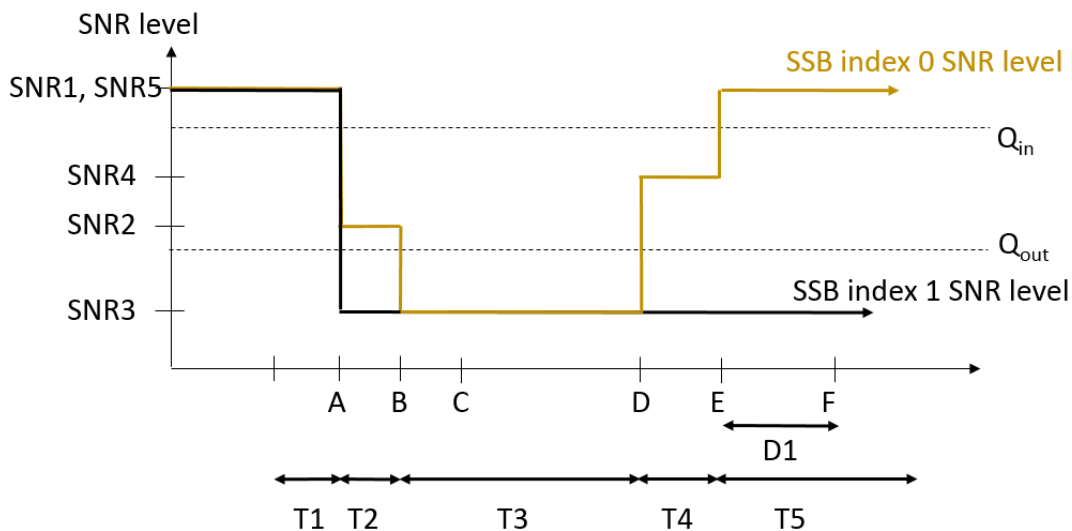
Figure 7.5.1.4.4-1: SNR variation for in-sync testing

7.5.1.4.4.1 Initial conditions

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

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1 of 38.521-2 [18].

This test shall be tested using any of the test configurations in Table 7.5.1.4.4.1-1.

Table 7.5.1.4.4.1-1: Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode supported test configurations for FR2 PCell

Configuration	Description
7.5.1.4-1	TDD, SSB SCS 120 KHz, data SCS 120KHz, BW 100 MHz

Configure the test equipment and the DUT according to the parameters in Table 7.5.1.4.4.1-2

Table 7.5.1.4.4.1-2: Initial conditions for Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.2, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.5.1.4.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.3.4.1	
Exceptions to connection diagram	N/A		

1.   The test parameters for PCell are given in Table 7.5.1.4.4.1-3

2.   Message contents are defined in clause 7.5.1.4.4.3.

3.   There is one carrier and one cell specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.5.1.4.4.1-3: General test parameters for FR2 in-sync testing in DRX mode

Parameter		Unit	Value
			Test 1
Active PCell			Cell 1
RF Channel Number			1
Duplex mode	Config 1		TDD
BW$_{channel}$	Config 1		100: N$_{RB,c}$ = 66
Data RBs allocated	Config 1		66
DL initial BWP configuration	Config 1		DLBWP.0.1
DL dedicated BWP configuration	Config 1		DLBWP.1.1
UL initial BWP configuration	Config 1		ULBWP.0.1
UL dedicated BWP configuration	Config 1		ULBWP.1.1
TDD Configuration	Config 1		TDDConf.3.1
RMSI CORESET Reference Channel	Config 1		CR.3.1 TDD
Dedicated CORESET Reference Channel	Config 1		CCR.3.1 TDD
SSB Configuration	Config 1		SSB.1 FR2
SMTC Configuration	Config 1		SMTC.3
PDSCH/PDCCH subcarrier spacing	Config 1		120 KHz
PRACH Configuration	Config 1		PRACH.4 FR2
SSB index assigned as RLM RS	Config 1		0,1
OCNG parameters			OP.1
CP length			Normal
In sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	4
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	0
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	0
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
Out of sync transmission parameters	DCI format		1-0
	Number of Control OFDM symbols		2
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX Configuration			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
reportConfigType			periodic
reportQuantity			cri-RI-PMI-CQI
CSI reporting periodicity		slot	40
CSI reporting offset		slot	4
TCI states for PDCCH/PDSCH			TCI.State.2
CSI-RS for tracking	Config 1		TRS.2.1 TDD
T1		s	0.2
T2		s	0.2
T3		s	2.8
T4		s	0.2
T5		s	3.88
D1		s	3.84

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.

7.5.1.4.4.2   Test Procedure

Editor's Note: Test procedure updates to ensure accurate FR2 test measurement state is TBD

There is one cell (Cell 1), which is the active NR cell, in the test. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 (PCell). The UE shall be configured for periodic CQI reporting in PUCCH [format 1] with a reporting periodicity as mentioned in the above table 7.5.1.4.4.1-3.

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

2. Set the parameters according to T1 in Table 7.5.1.4.5-1. Propagation conditions are set according to Annex C.2.2. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.1.4.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.1.4.5-1. T3 starts.

5. When T3 expires, the SS shall change the SNR value to T4 as specified in Table 7.5.1.4.5-1. T4 starts.

6. When T4 expires, the SS shall change the SNR value to T5 as specified in Table 7.5.1.4.5-1. T5 starts.

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

   Otherwise the number of failed tests is increased by one.

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

7.5.1.4.4.3   Message Contents

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

Table 7.5.1.4.4.3-1: Common Exception messages for Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED Table H.3.1-7 Table H.3.5-4 Table H.3.5-9 with Condition SSB RLM Table H.3.7-1 with condition DRX.3 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 7.5.1.4.4.3-2: PDCCH Search Space

Derivation Path: TS 38.508-1 [14], Table 4.6.3-162			
Information Element	**Value/remark**	**Comment**	**Condition**
SearchSpace ::= SEQUENCE {			
monitoringSlotPeriodicityAndOffset CHOICE {			
sl1	NULL		
}			
duration	2		
monitoringSymbolsWithinSlot	11000000000000	Symbols 0 and 1	
nrofCandidates SEQUENCE {			
aggregationLevel1	n0		
aggregationLevel2	n0		
aggregationLevel4	n0		
aggregationLevel8	n1	AL8	
aggregationLevel16	n0		
}			
searchSpaceType CHOICE {			
ue-Specific SEQUENCE {			USS
dci-Formats	formats0-0-And-1-0	DCI Format 1_0	
}			
}			
}			

Table 7.5.1.4.4.3-3: *RLF-TimersAndConstant*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	**Value/remark**	**Comment**	**Condition**
RLF-TimersAndConstants ::= SEQUENCE {			
t310	ms4000		
n310	n1		
n311	n1		
t311-v1530	ms1000		
}			

Table 7.5.1.4.4.3-4: CSI-FrequencyOccupation

Derivation Path: TS 38.508-1 [14], Table 4.6.3-33			
Information Element	**Value/remark**	**Comment**	**Condition**
CSI-FrequencyOccupation ::= SEQUENCE {			
startingRB	0		
nrofRBs	66	100 MHz (120 KHz SCS)	
}			

7.5.1.4.5   Test Requirement

Table 7.5.1.4.4.1-3 and 7.5.1.4.5-1 define the primary level settings including test tolerances for Radio Link Monitoring In-sync Test for FR2 PCell configured with SSB-based RLM RS in DRX mode.

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

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

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

Table 7.5.1.4.5-1: OTA related cell specific test parameters for FR2 (Cell 1) for in-sync radio link monitoring test in DRX mode

Parameter		Unit	Test 1				
			T1	T2	T3	T4	T5
AoA setup			Setup 1 defined in A.9.1				
Assumption for UE beams [Note 5]			Rough				
EPRE ratio of PDCCH DMRS to SSS		dB	0				
EPRE ratio of PDCCH to PDCCH DMRS		dB	0				
EPRE ratio of PBCH DMRS to SSS		dB	0				
EPRE ratio of PBCH to PBCH DMRS		dB					
EPRE ratio of PSS to SSS		dB					
EPRE ratio of PDSCH DMRS to SSS		dB					
EPRE ratio of PDSCH to PDSCH DMRS		dB					
EPRE ratio of OCNG DMRS to SSS		dB					
EPRE ratio of OCNG to OCNG DMRS		dB					
ssb-Index 0 SNR	Config 1	dB	3.3[Note 6]	-4.7[Note 6]	-15.4	-4.9	3.3[Note 6]
ssb-Index 1 SNR	Config 1		3.3[Note 6]	-15.4	-15.4	-15.4	-15.4
N_{oc}	Config 1	dBm/15 KHz	-104.7dBm				
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 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.							
Note 5: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.							
Note 6: This value allows up to 1dB degradation from applied SNR to UE baseband.							

7.5.1.5 to 7.5.1.8

7.5.1.9 NR SA FR2 radio link monitoring UE scheduling restrictions

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

-The test tolerances and test system uncertainties applicable to this test are undefined.

-Message content is TBD

7.5.1.9.1 Test purpose

The purpose of this test is to verify that the NR UE correctly follows the RLM scheduling restrictions requirements defined in TS 38.133 [6] clause 8.1.7, and to verify 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.

7.5.1.9.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

This test is only applicable to UE which supports *pdcch-MonitoringAnyOccasions* or *pdcch-MonitoringAnyOccasionsWithSpanGap*.

7.5.1.9.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 7.5.1.0.5.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.1.9.

7.5.1.9.4 Test description

There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of one time period with time duration of T1. Figure 5.5.1.9.4-1 shows the Time multiplexed downlink transmissions from each Angle of Arrival. The UE is required during time period T1 to transmit ACK/NACK correctly upon scheduling of PDSCH.
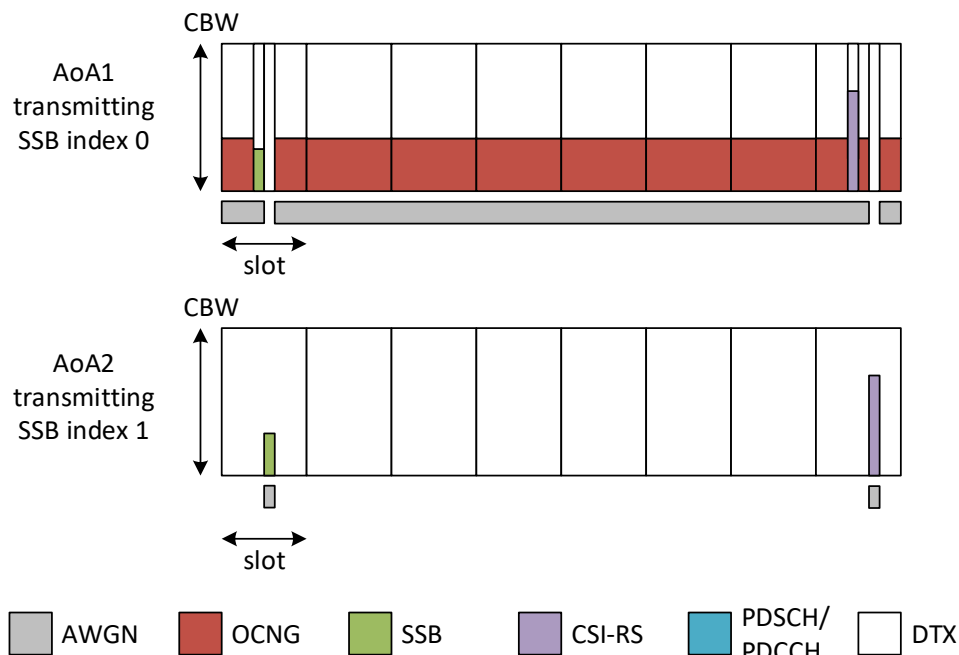
Figure 7.5.1.9.4-1: Time multiplexed downlink transmissions

7.5.1.9.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.1.9.4.1-1.

Table 7.5.1.9.4.1-1: Supported test configurations for NR SA FR2 radio link monitoring UE scheduling restrictions

Configuration	Description
7.5.1.9-1	120 kHz SSB SCS, 120 kHz RMC SCS, 100 MHz bandwidth, TDD duplex mode

Configure the test equipment and the DUT according to the parameters in Table 7.5.1.9.4.1-2

Table 7.5.1.9.4.1-2: Initial conditions for NR SA FR2 radio link monitoring UE scheduling restrictions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E.1.2, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.5.1.9.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.3.4.1	
Exceptions to connection diagram	N/A		

1. The test parameters for PCell are given in Table 7.5.1.9.4.1-3

2. Message contents are defined in clause 7.5.1.9.4.3.

3. There is one carrier and one cell specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.5.1.9.4.1-3: General test parameters for NR SA FR2 radio link monitoring UE scheduling restrictions

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

7.5.1.9.4.2 Test Procedure

There is one cell (Cell 1), which is the active NR cell, in the test. Prior to the start of the time duration T1, the UE shall be fully synchronized to PCell. During the test PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE would have ACK/NACK sending.

1. Set the parameters according to T1 in Table 7.5.1.9.4.4-1. Propagation conditions are set according to Annex C.2.2. T1 starts.

2. If the SS receives ACK/NACK on each UL transmission occasion scheduled by PDCCH which are not overlapped with SSBs configured for radio link monitoring during T1, the number of successful tests is increased by one. otherwise the number of failed tests is increased by one.

3. The UE is switched off and then on. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [10] clause 4.5.

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

7.5.1.9.4.3 Message Contents

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

Table 7.5.1.9.4.3-1: Common Exception messages for NR SA FR2 radio link monitoring UE scheduling restrictions

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

7.5.1.9.5 Test Requirement

Table 7.5.1.9.4.1-3 and 7.5.1.9.5-1 define the primary level settings including test tolerances for NR SA FR2 radio link monitoring UE scheduling restrictions.

Table 7.5.1.9.5-1: Cell specific test parameters for NR SA FR2 radio link monitoring UE scheduling restrictions

Parameter	Unit	Test configuration	Cell 1	
AoA setup		1	Setup 3 defined in A.9.3	
			AoA1	AoA2
Assumption for UE beams Note 1			Rough	Rough
TDD configuration		1	TDDConf.3.1	
BW$_{channel}$	MHz	1	100: N$_{RB,c}$ = 66	
Data RBs allocated		1	24	
PDSCH Reference measurement channel		1	SR.3.2 TDD	Not sent
RMSI CORESET RMC configuration		1	CR.3.1 TDD	Not sent
Dedicated CORESET RMC configuration		1	CCR.3.2 TDD	Not sent
TRS configuration		1	TRS.2.1 TDD	TRS.2.2 TDD
PDCCH/PDSCH TCI state		1	TCI.State.2	N/A
OCNG Pattern		1	OP.5	Not sent
Initial DL BWP configuration		1	DLBWP.0.1	
Initial UL BWP configuration		1	ULBWP.0.1	
RLM-RS		1	SSB with index 0	SSB with index 1
N_{oc}	dBm/15kHz	1	-92.1	-92.1
N_{oc} Note2	dBm/SCS	1	-83.1	-83.1
$\hat{E}_s/N_{oc}$	dB	1	2	2
$\hat{E}_s/I_{ot\ BB}$ Note 4	dB	1	1	1
SSB_RP Note3	dBm/SCS	1	-81.1	-81.1
Io	dBm/95.04 MHz	1	-54.35	-54.35
Time multiplexing of the downlink transmissions from each AoA		1	Defined in Figure 7.5.1.9.4-1	
Propagation Condition		1	AWGN	AWGN
Note 1: Information about types of UE beam is given in TS 38.133 [6] B.2.1.3 and does not limit UE implementation or test system implementation.				
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: Es/Iot, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.				
Note 4: Calculation of Es/Iot$_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1dB for UE multi-band relaxation factor ΔMB$_S$ from TS 38.101-2 [3] Table 6.2.1.3-4.				

The UE behaviour during time duration T1 follows the requirements defined in TS 38.133 [6] clause 8.1.7.3:

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.

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

7.5.2   Interruption

7.5.3   SCell activation and deactivation delay

7.5.3.0   Minimum conformance requirements

7.5.3.0.1   Minimum conformance requirements for SCell activation delay for deactivated SCell

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

$n + \frac{T_{HARQ} + T_{activation\_time} + T_{CSI\_Reporting}}{NR\ slot\ length}$, where:

T_{HARQ} (in ms) is the timing between DL data transmission and acknowledgement as specified in TS 38.213 [8]

$T_{activation\_time}$ is the SCell activation delay in millisecond.

If the SCell is known and belongs to FR1, $T_{activation\_time}$ is:

- $T_{FirstSSB}$+ 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 Ês/Iot ≥ -2 dB is fulfilled, $T_{activation\_time}$ is:

- $T_{FirstSSB\_MAX}$ + T_{SMTC_MAX} + 2*T_{rs} + 5ms.

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 TS 38.133 [6] clause 3.6.3,

- The parameter *ssb-PositionsInBurst* is same for the serving cell(s) and the SCell.

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, $T_{activation\_time}$ 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 or in FR2:

If the target SCell is known to UE and semi-persistent CSI-RS is used for CSI reporting, then $T_{activation\_time}$ is:

- 3ms + max($T_{uncertainty\_MAC}$ + $T_{FineTiming}$ + 2ms, $T_{uncertainty\_SP}$), where $T_{uncertainty\_MAC}$=0 and $T_{uncertainty\_SP}$=0 if UE receives the SCell activation command, semi-persistent CSI-RS activation command and TCI state activation command at the same time.

If the target SCell is known to UE and periodic CSI-RS is used for CSI reporting, then $T_{activation\_time}$ is:

- max ($T_{uncertainty\_MAC}$ + 5ms + $T_{FineTiming}$, $T_{uncertainty\_RRC}$ + T_{RRC_delay}-T_{HARQ}), where $T_{uncertainty\_MAC}$=0 if UE receives the SCell activation command and TCI state activation commands at the same time.

If the PCell/PSCell and the target SCell are in a band pair with independent beam management and the target SCell is unknown to UE and semi-persistent CSI-RS is used for CSI reporting, provided that the side condition Ês/Iot ≥ -2dB is fulfilled, then $T_{activation\_time}$ is:

- 6ms + $T_{FirstSSB\_MAX}$ + 15*T_{SMTC_MAX} + 8*T_{rs} + $T_{L1-RSRP, measure}$ + $T_{L1-RSRP, report}$ + T_{HARQ} + max($T_{uncertainty\_MAC}$ + $T_{FineTiming}$ + 2ms, $T_{uncertainty\_SP}$).

If the PCell/PSCell and the target SCell are in a band pair with independent beam management and the target SCell is unknown to UE and periodic CSI-RS is used for CSI reporting, provided that the side condition Ês/Iot ≥ -2dB is fulfilled, then $T_{activation\_time}$ is:

- $3ms + T_{FirstSSB\_MAX} + 15*T_{SMTC\_MAX} + 8*T_{rs} + T_{L1-RSRP, measure} + T_{L1-RSRP, report} + \{(T_{HARQ} + T_{uncertainty\_MAC} + 5ms + T_{FineTiming}), (T_{uncertainty\_RRC} + T_{RRC\_delay})\}$.

Where,

T_{SMTC_MAX}:

- In FR1, in case of intra-band SCell activation, T_{SMTC_MAX} is the longer SMTC periodicity between active serving cells and SCell being activated provided the cell specific reference signals from the active serving cells and the SCells being activated or released are available in the same slot; in case of inter-band SCell activation, T_{SMTC_MAX} is the SMTC periodicity of SCell being activated.

- In FR2, T_{SMTC_MAX} is the longer SMTC periodicity between active serving cells and SCell being activated provided that in Rel-15 only support FR2 intra-band CA.

- T_{SMTC_MAX} is bounded to a minimum value of 10ms.

T_{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 are no requirements if the SSB transmission periodicity is not 5ms

$T_{FirstSSB}$: is the time to the end of the first completed SSB burst indicated by the SMTC after slot n + $\frac{T_{HARQ}+3ms}{NR\ slot\ length}$

$T_{FirstSSB\_MAX}$: Is the time to the end of the first completed SSB burst indicated by the SMTC after slot n + $\frac{T_{HARQ}+3ms}{NR\ slot\ length}$, 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.

$T_{FineTiming}$ 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.

$T_{L1-RSRP, measure}$ is L1-RSRP measurement delay $T_{L1-RSRP\_Measurement\_Period\_SSB}$ (ms) or $T_{L1-RSRP\_Measurement\_Period\_CSI-RS}$ based on applicability as defined in TS 38.133 [6] clause 9.5 assuming M=1.

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

$T_{uncertainty\_MAC}$ 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.

$T_{uncertainty\_RRC}$ 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_{RRC_delay} is the RRC procedure delay as specified in TS 38.331 [13].

Longer dekays for RRM measurement requirements, and in case of FR2 also SSB based RLM/BFD/CBD/L1-RSRP measurement requirements, can be expected during the cell detection time for unknown SCell activation.

$T_{CSI\_reporting}$ 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 [13].

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 TS 38.133 [6] 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 TS 38.133 [6] 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 class1 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 TS 38.133 [6] 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 [13] signalling of *smtc2* prior to the activation command, T_{SMTC_Scell} follows *smtc1* or *smtc2* according to the physical cell ID of the target cell being activated. T_{SMTC_MAX} follows *smtc1* or *smtc2* according to the physical cell IDs of the target cells being activated and the active serving cells.

In addition to CSI reporting defined above, UE shall also apply other actions related to the activation command specified in TS 38.331 [13] 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 TS 38.133 [6] clause 8.2 shall not occur before slot $n+1+\dfrac{T_{HARQ}}{NR\ slot\ length}$ and not occur after slot $n+1+\dfrac{T_{HARQ}+3+T_{SMTC\_MAX}+T_{SMTC\_duration}}{NR\ slot\ length}$.

The interruption on PCell or any activated SCell in MCG for NR standalone mode specified in TS 38.133 [6] clause 8.2 shall not occur before slot $n+1+\dfrac{T_{HARQ}}{NR\ slot\ length}$ and not occur after slot $n+1+\dfrac{T_{HARQ}+3+T_{SMTC\_MAX}+T_{SMTC\_duration}}{NR\ slot\ length}$.

Starting from the slot specified in TS 38.213 [8] clause 4.3 (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 TS 38.213 [8] clause 4.3 (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.

The normative reference for this requirement is TS 38.133 [6] clause 8.3.2.

7.5.3.0.2 Minimum conformance requirements for SCell deactivation delay for activated SCell

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

The interruption on PSCell or any activated SCell in SCG for EN-DC mode specified in TS 38.133 [6] clause 8.2 shall not occur before slot $n+1+[\frac{T_{HARQ}}{NR\ slot\ length}]$ and not occur after slot $n+1+\frac{T_{HARQ} + 3ms}{NR\ slot\ length}$.

The interruption on PCell or any activated SCell in MCG for NR standalone mode specified in TS 38.133 [6] clause 8.2 shall not occur before slot $n+1+[\frac{T_{HARQ}}{NR\ slot\ length}]$ and not occur after slot $n+1+\frac{T_{HARQ} + 3ms}{NR\ slot\ length}$.

The normative reference for this requirement is TS 38.133 [6] clause 8.3.3.

7.5.3.1 NR SA FR2-FR2 intra-band SCell activation and deactivation delay

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

- Test procedure

- Connection diagram

- Message contents are not complete.

- TT analysis is missing.

- Test Applicability in TS38.522

- Annex F

- Cell configuration mapping in Annex E

7.5.3.1.1 Test purpose

The purpose of this test is:

- To verify the requirement for the SCell activation and deactivation times are within the requirements specified in TS 38.133 [6] clause 8.3, when the PCell and SCell are is in FR2 intra-band and SCell is known by the UE at the time of activation.

7.5.3.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards and supporting 2DL CA.

7.5.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 7.5.3.0.1 and 7.5.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.3.1.

7.5.3.1.4 Test description

7.5.3.1.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 7.5.3.1.4.1-1.

Table 7.5.3.1.4.1-1: Supported test configurations for NR SA FR2 SCell activation case

Configuration	Description
7.5.3.1-1	NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode

Configure the test equipment and the DUT according to the parameters in Table 7.5.3.1.4.1-2.

Table 7.5.3.1.4.1-2: Initial conditions for NR SA FR2 SCell activation case

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.5.3.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	TBD	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 7.5.3.1.4.1-3.

2. Message contents are defined in clause 7.5.3.1.4.3.

3. There are two NR carriers and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is SCell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

Table 7.5.3.1.4.1-3: General test parameters for NR SA FR2 SCell activation case

Parameter	Unit	Value	Comment
RF Channel Number		1,2	Two NR radio channels are used for this test, cell 1 and cell2 use RF channel 1 and 2, respectively.
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
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	$\leq$ Time alignment error as specified in TS 38.104 [28] 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.
T3	s	1	During this time the UE shall deactivate the SCell.
T_{HARQ}	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 [8] depends on UE's capability
$T_{CSI\_Reporting}$	ms	15	the delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting (clause 5.2.2.5 in TS 38.214) and uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [13].

7.5.3.1.4.2   Test procedure

TBD

7.5.3.1.4.3   Message contents

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

Table 7.5.3.1.4.3-1: Common Exception messages

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

7.5.3.1.5   Test requirement

TBD

7.5.3.2   NR SA FR1-FR2 inter-band SCell activation and deactivation delay

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

- Test procedure

- Connection diagram

- Message contents are not complete.

- TT analysis is missing.

- Test Applicability in TS38.522

- Annex F

- Cell configuration mapping in Annex E

7.5.3.2.1 Test purpose

The purpose of this test is:

  - To verify the requirement for the SCell activation and deactivation times are within the requirements specified in TS 38.133 [6] clause 8.3, when the PCell is in FR1 and SCell is in FR2 and SCell is known by the UE at the time of activation.

7.5.3.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards and supporting 2DL CA.

7.5.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 7.5.3.0.1 and 7.5.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.3.2.

7.5.3.2.4 Test description

7.5.3.2.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 7.5.3.2.4.1-1.

Table 7.5.3.2.4.1-1: Supported test configurations for NR SA FR2 SCell activation case

Configuration	Description
7.5.3.2-1	PCell: 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
	Target SCell: 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
7.5.3.2-2	PCell: 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
	Target SCell: 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
7.5.3.2-3	PCell: 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
	Target SCell: 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
Note: The UE is only required to pass in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 7.5.3.2.4.1-2.

Table 7.5.3.2.4.1-2: Initial conditions for NR SA FR2 SCell activation case

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.5.3.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	TBD	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 7.5.3.2.4.1-3.

2. Message contents are defined in clause 7.5.3.2.4.3.

3. There are two NR carriers and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is SCell. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

Table 7.5.3.2.4.1-3: General test parameters for NR SA FR2 SCell activation case

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
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	$\leq$ Time alignment error as specified in TS 38.104 [28] 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	2	During this time the UE shall activate the SCell.
T3	s	1	During this time the UE shall deactivate the SCell.
T_{HARQ}	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 [8] depends on UE's capability
$T_{CSI\_Reporting}$	ms	15	the delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting (clause 5.2.2.5 in TS 38.214) and uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [13].

7.5.3.2.4.2   Test procedure

TBD

7.5.3.2.4.3   Message contents

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

Table 7.5.3.2.4.3-1: Common Exception messages

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

7.5.3.2.5   Test requirement

TBD

7.5.4 UE UL carrier RRC reconfiguration delay

7.5.5 Link recovery procedures

7.5.5.0 Minimum conformance requirements

7.5.5.0.1 Minimum conformance requirements for SSB-based BFD and link recovery procedures

Same as in the clause 5.5.5.0.1.

7.5.5.0.2 Minimum conformance requirements for CSI-RS-based BFD and link recovery procedures

Same as in the clause 5.5.5.0.2.

7.5.5.0.3 Scheduling availability of UE during beam failure detection and candidate beam detection

Same as in the clause 5.5.5.0.3.

7.5.5.0.4 Requirements for Beam Failure Recovery in SCell

Same as in the clause 5.5.5.0.4.

7.5.5.1 NR SA FR2 SSB-based beam failure detection and link recovery in non-DRX

Editor's Note: This test case is complete for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

7.5.5.1.1 Test purpose

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set q_0 configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set q_1, and 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 TS 38.133 [6] clause 8.5.

7.5.5.1.2 Test applicability

This test applies to all types of NR UE release 15 onwards.

7.5.5.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.5.1.

7.5.5.1.4 Test description

There is one NR serving cell configured in this test. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 7.5.5.1.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate SSB based beam failure. Figure 7.5.5.1.4-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set q_1 of the candidate beam used for link recovery.
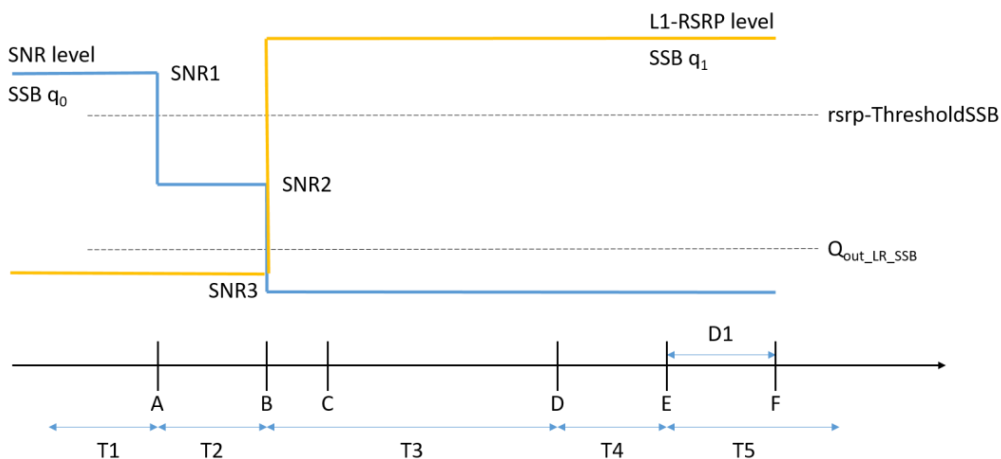
Figure 7.5.5.1.4-1: SNR and L1-RSRP variation for NR SA FR2 SSB-based beam failure detection and link recovery in non-DRX

7.5.5.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.5.1.4.1-1.

Table 7.5.5.1.4.1-1: Supported test configurations for NR SA FR2 SSB-based beam failure detection and link recovery in non-DRX

Configuration	Description
7.5.5.1-1	TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth
7.5.5.1-2	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	

Configure the test equipment and the DUT according to the parameters in Table 7.5.5.1.4.1-2.

Table 7.5.5.1.4.1-2: Initial conditions for NR SA FR2 SSB-based beam failure detection and link recovery in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 7.5.5.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 7.5.5.1.4.1-3. The measurement gap configuration is according to Table 7.5.5.1.4.1-4.

2. Message contents are defined in clause 7.5.5.1.4.3.

3. There is one NR carrier and one NR cells specified in the test. Cell 1 is the NR cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.5.5.1.4.1-3: General test parameters for NR SA FR2 SSB-based beam failure detection and link recovery in non-DRX

Parameter		Test Config.	Unit	Value	Comment
				Test 1	
Active PCell		1-2		Cell 1	
RF Channel Number		1-2		1	
Duplex mode		1-2		TDD	
TDD Configuration		1-2		TDDConf.3.1	Table A.1.5-3
BW$_{channel}$		1-2	MHz	100: N$_{RB,c}$ = 66	
Data RBs allocated		1-2		66	
PDSCH/PDCCH subcarrier spacing		1-2	kHz	120	
DL initial BWP configuration		1-2		DLBWP.0.1	Table A.8.1-1
DL dedicated BWP configuration		1-2		DLBWP.1.1	Table A.8.1-2
UL initial BWP configuration		1-2		ULBWP.0.1	Table A.8.2-1
UL dedicated BWP configuration		1-2		ULBWP.1.1	Table A.8.2-2
PDSCH Reference Channel		1		SR.3.2 TDD	Table A.1.1.2-3
		2		SR.3.3 TDD	
RMSI CORESET Reference Channel		1		CR.3.1 TDD	Table A.1.2.2-3
		2		CR.3.2 TDD	
Dedicated CORESET Reference Channel		1		CCR.3.1 TDD	Table A.1.3.2-3
		2		CCR.3.7 TDD	
OCNG parameters		1-2		OP.1	Table A.2.1-1
CP length		1-2		Normal	
PDSCH/PDCCH TCI state		1-2		TCI.State.0	Table A.10.2-1
CSI-RS for tracking		1-2		TRS.2.1 TDD	Table A.1.4A.2.1-1
SSB Configuration		1		SSB.1 FR2	Table A.3.2-1
		2		SSB.2 FR2	
SMTC Configuration		1-2		SMTC.3	Table A.4-1
PRACH Configuration		1-2		PRACH.2 FR2	Table A.7.2-1
DRX configuration		1-2		OFF	
SSB index assigned as BFD RS (q$_0$)		1-2		0	
SSB index assigned as CBD RS (q$_1$)		1-2		1	
SSB index assigned as RLM RS		1-2		0,1	
Beam failure detection transmission parameters	DCI format	1-2		1-0	
	Number of Control OFDM symbols	1-2		2	
	Aggregation level	1-2	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	1-2	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	1-2	dB	0	
	DMRS precoder granularity	1-2		REG bundle size	
	REG bundle size	1-2		6	
Gap pattern ID		1-2		gp0	
gapOffset		1-2	ms	0	
rlmInSyncOutOfSyncThreshold		1-2		absent	Value 0 is applied. (TS 38.133 [6] Table 8.1.1-1).
rsrp-ThresholdSSB		1	dBm/SCS	-109 [Note 3]	Threshold used for Q$_{in\_LR\_SSB}$
		2		-106 [Note 3]	

powerControlOffsetSS	1-2		db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMaxCount	1-2		n1	see TS 38.321 [12], clause 5.17
beamFailureDetectionTimer	1-2		pbfd4	see TS 38.321 [12], clause 5.17
CSI-RS configuration for CSI reporting	1-2		CSI-RS.3.1 TDD	Table A.1.4.2-3
reportConfigType	1-2		periodic	
reportQuantity	1-2		cri-RI-PMI-CQI	
CSI reporting periodicity	1-2	slot	40	
CSI reporting offset	1-2	slot	4	
T310	1-2	ms	1000	
N310	1-2		2	
T1	1-2	s	1	The UE shall be fully synchronized to cell 1 during T1
T2	1-2	s	2.61	
T3	1-2	s	1.64	
T4	1-2	s	0	
T5	1-2	s	1.01	
D1	1-2	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. Note 3: Including test tolerance given in Annex F.1.3.2.				

Table 7.5.5.1.4.1-4: Void

7.5.5.1.4.2   Test procedure

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

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

2.   Set the parameters of NR Cell 1 according to T1 in Table 7.5.5.1.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3.   When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.5.1.5-1. T2 starts.

4.   When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.5.1.5-1. T3 starts.

5.   When T3 expires the SS shall change the SNR value to T4 as specified in Table 7.5.5.1.5-1. T4 starts.

6.   When T4 expires the SS shall change the SNR value to T5 as specified in Table 7.5.5.1.5-1. T5 starts.

7.   If the SS:

   a) detects uplink power on NR carrier in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point A to time point B; and

   b) does not detect preamble on a beam associated with candidate beam set q_1 before time point B; and

   c) detects preamble on a beam associated with candidate beam set q_1 before time point F (D1 after the start of T5),

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

8.   When T5 expires the SS shall change the SNR value to T1 as specified in Table 7.5.5.1.5-1.

9.   Wait 1s for the UE to re-establish the connection or continue directly to step 10. If the UE re-establishes the connection within 1s continue to step 11. Otherwise continue to step 10.

10. Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

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

7.5.5.1.4.3   Message contents

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

Table 7.5.5.1.4.3-1: Common Exception messages for NR SA FR2 SSB-based beam failure detection and link recovery in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED; Table H.3.1-3 with condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier centre of High range) Table H.3.1-4 with a3-offset = -6dB; Table H.3.1-6 with condition gapUE and BFD. Table H.3.1-8 with Condition SSB BFD Table H.3.1-10 with Condition SSB Table H.3.1-10A

7.5.5.1.5   Test requirement

Tables 7.5.5.1.4.1-3 and 7.5.5.1.5-1 define the primary level settings including test tolerances for NR SA FR2 SSB-based beam failure detection and link recovery in non-DRX.

Table 7.5.5.1.5-1: NR Cell specific test parameters for NR SA FR2 SSB-based beam failure detection and link recovery in non-DRX

Parameter		Unit	Test 1				
			T1	**T2**	**T3**	**T4**	**T5**
AoA setup			Setup 1 defined in A.9				
Assumption for UE beams [Note 10]			Rough				
EPRE ratio of PDCCH DMRS to SSS		dB	0				
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					
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 set q_0	Config 1-2	dB	13.7 [Note 11,12]	5.7 [Note 11,12]	-12	-12	-12
SNR_SSB of set q_1	Config 1-2	dB	0.2	0.2	20 [Note 12]	20 [Note 12]	20 [Note 12]
SSB_RP of set q_1	Config 1	dBm/SCS	-104.5	-104.5	-84.7	-84.7	-84.7
	Config 2		-101.5	-101.5	-81.7	-81.7	-81.7
N_{oc}	Config 1	dBm/120 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 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 7.5.5.1.4-1.
Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE hich supports 4RX on all bands, the SNR during T3 is modified as specified in clause D.4.
Note 10: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation.
Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband
Note 12: Including test tolerance given in Annex F.1.3.2

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 = 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%.

7.5.5.2　　NR SA FR2 SSB-based beam failure detection and link recovery in DRX

Editor's Note: This test case is complete for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

7.5.5.2.1 Test purpose

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set q_0 configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set q_1, and 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 TS 38.133 [6] clause 8.5.

7.5.5.2.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting 5GS NR SA FR2 and long DRX cycle.

7.5.5.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.5.2.

7.5.5.2.4 Test description

There are one NR serving cell configured in this test. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 7.5.5.2.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate SSB based beam failure. Figure 7.5.5.2.4-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set q_1 of the candidate beam used for link recovery.
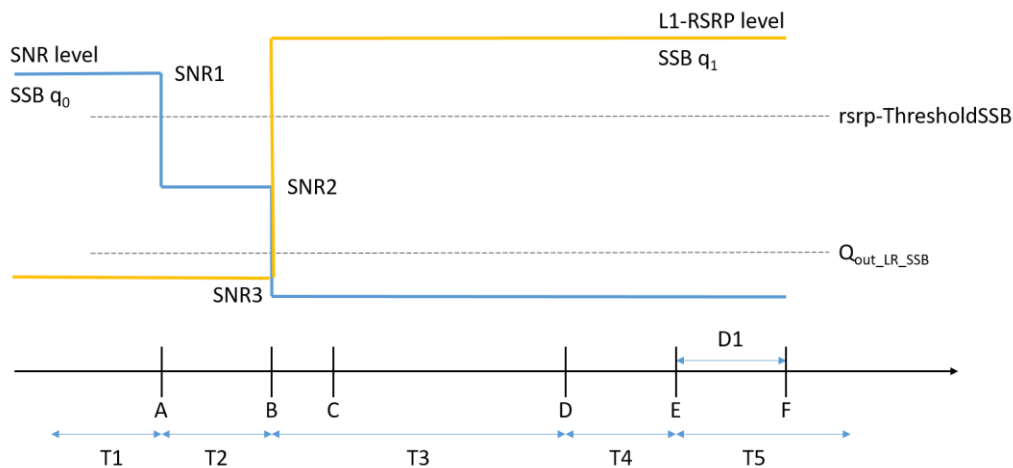
Figure 7.5.5.2.4-1: SNR and L1-RSRP variation for NR SA FR2 SSB-based beam failure detection and link recovery in DRX

7.5.5.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.5.2.4.1-1.

Table 7.5.5.2.4.1-1: Supported test configurations for NR SA FR2 SSB-based beam failure detection and link recovery in DRX

Configuration	Description
7.5.5.2-1	TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth
7.5.5.2-2	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

Configure the test equipment and the DUT according to the parameters in Table 7.5.5.2.4.1-2.

Table 7.5.5.2.4.1-2: Initial conditions for NR SA FR2 SSB-based beam failure detection and link recovery in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 7.5.5.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 7.5.5.2.4.1-3. The DRX configuration is according to Table 7.5.5.2.4.1-3. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

2. Message contents are defined in clause 7.5.5.2.4.3.

3. There is one NR carrier and one NR cells specified in the test. Cell 1 is the NR cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.5.5.2.4.1-3: General test parameters for NR SA FR2 SSB-based beam failure detection and link recovery in DRX

Parameter	Test Config.	Unit	Value	Comment
			Test 1	
Active PCell	1-2		Cell 1	
RF Channel Number	1-2		1	
Duplex mode	1-2		TDD	
TDD Configuration	1-2		TDDConf.3.1	Table A.1.5-3
BW$_{channel}$	1-2	MHz	100: N$_{RB,c}$ = 66	
Data RBs allocated	1-2		66	
PDSCH/PDCCH subcarrier spacing	1-2	kHz	120	
DL initial BWP configuration	1-2		DLBWP.0.1	Table A.8.1-1
DL dedicated BWP configuration	1-2		DLBWP.1.1	Table A.8.1-2
UL initial BWP configuration	1-2		ULBWP.0.1	Table A.8.2-1
UL dedicated BWP configuration	1-2		ULBWP.1.1	Table A.8.2-2
PDSCH Reference Channel	1		SR.3.2 TDD	Table A.1.1.2-3
	2		SR.3.3 TDD	
RMSI CORESET Reference Channel	1		CR.3.1 TDD	Table A.1.2.2-3
	2		CR.3.2 TDD	
Dedicated CORESET Reference Channel	1		CCR.3.1 TDD	Table A.1.3.2-3
	2		CCR.3.7 TDD	

OCNG parameters		1-2		OP.1	Table A.2.1-1
CP length		1-2		Normal	
PDSCH/PDCCH TCI state		1-2		TCI.State.0	Table A.10.2-1
CSI-RS for tracking		1-2		TRS.2.1 TDD	Table A.1.4A.2.1-1
SSB Configuration		1		SSB.1 FR2	Table A.3.2-1
		2		SSB.2 FR2	
SMTC Configuration		1-2		SMTC.3	Table A.4-1
PRACH Configuration		1-2		PRACH.2 FR2	Table A.7.2-1
DRX configuration		1-2		DRX.3	Table A.5-1
SSB index assigned as BFD RS (q_0)		1-2		0	
SSB index assigned as CBD RS (q_1)		1-2		1	
SSB index assigned as RLM RS		1-2		0,1	
Beam failure detection transmission parameters	DCI format	1-2		1-0	
	Number of Control OFDM symbols	1-2		2	
	Aggregation level	1-2	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	1-2	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	1-2	dB	0	
	DMRS precoder granularity	1-2		REG bundle size	
	REG bundle size	1-2		6	
Gap pattern ID		1-2		N/A	
rlmInSyncOutOfSyncThreshold		1-2		absent	Value 0 is applied. (TS 38.133 [6] Table 8.1.1-1).
rsrp-ThresholdSSB		1	dBm/SCS	-109 [Note 3]	Threshold used for $Q_{in\_LR\_SSB}$
		2		-106 [Note 3]	
powerControlOffsetSS		1-2		db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMaxCount		1-2		n1	see TS 38.321 [12], clause 5.17
beamFailureDetectionTimer		1-2		pbfd4	see TS 38.321 [12], clause 5.17
CSI-RS configuration for CSI reporting		1-2		CSI-RS.3.1 TDD	Table A.1.4.2-3
reportConfigType		1-2		periodic	
reportQuantity		1-2		cri-RI-PMI-CQI	
CSI reporting periodicity		1-2	slot	40	
CSI reporting offset		1-2	slot	4	
T310		1-2	ms	1000	
N310		1-2		2	
T1		1-2	s	1	The UE shall be fully synchronized to cell 1 during T1
T2		1-2	s	3.37	
T3		1-2	s	2.8	
T4		1-2	s	0	
T5		1-2	s	0.61	
D1		1-2	s	0.57	
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: Including test tolerance given in Annex F.1.3.2					

Table 7.5.5.2.4.1-4: Void

7.5.5.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to NR Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled.

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

2. Set the parameters of NR Cell 1 according to T1 in Table 7.5.5.2.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.5.2.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.5.2.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 7.5.5.2.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 7.5.5.2.5-1. T5 starts.

7. If the SS:

   a) detects uplink power on NR carrier in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point A to time point B; and

   b) does not detect preamble on a beam associated with candidate beam set q_1 before time point B; and

   c) detects preamble on a beam associated with candidate beam set q_1 before time point F (D1 after the start of T5),

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

8. When T5 expires the SS shall change the SNR value to T1 as specified in Table 7.5.5.2.5-1.

9. Wait 1s for the UE to re-establish the connection or continue directly to step 10. If the UE re-establishes the connection within 1s continue to step 11. Otherwise continue to step 10.

10. Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

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

7.5.5.2.4.3 Message contents

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

Table 7.5.5.2.4.3-1: Common Exception messages for NR SA FR2 SSB-based beam failure detection and link recovery in DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-8 with Condition SSB BFD Table H.3.1-10 with Condition SSB Table H.3.1-10A Table H.3.7-1 with condition DRX.3

7.5.5.2.5 Test requirement

Tables 7.5.5.2.4.1-3 and 7.5.5.2.5-1 define the primary level settings including test tolerances for NR SA FR2 SSB-based beam failure detection and link recovery in DRX.

Table 7.5.5.2.5-1: NR Cell specific test parameters for NR SA FR2 SSB-based beam failure detection and link recovery in DRX

Parameter		Unit	Test 1				
			T1	T2	T3	T4	T5
AoA setup			Setup 1 defined in A.9				
Assumption for UE beams [Note 10]			Rough				
EPRE ratio of PDCCH DMRS to SSS		dB					
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					
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 set q_0	Config 1-2	dB	13.7 [Note 11,12]	5.7 [Note 11,12]	-12	-12	-12
SNR_SSB of set q_1	Config 1-2	dB	0.2	0.2	20 [Note 12]	20 [Note 12]	20 [Note 12]
SSB_RP of set q_1	Config 1	dBm/SCS	-104.5	-104.5	-84.7	-84.7	-84.7
	Config 2		-101.5	-101.5	-81.7	-81.7	-81.7
N_{oc}	Config 1-2	dBm/120 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: Void
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 7.5.5.2.4-1.
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 D.4.
Note 10: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation.
Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband.
Note 12: Including test tolerance given in

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%.

7.5.5.3 NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX

Editor's Note: This test case is complete for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

7.5.5.3.1 Test purpose

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set q_0 configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set q_1, and 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 TS 38.133 [6] clause 8.5.

7.5.5.3.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting CSI-RS-based RLM and link recovery .

7.5.5.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.5.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.5.3.

7.5.5.3.4 Test description

There is one NR serving cell configured in this test. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 7.5.5.3.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate CSI-RS based beam failure. Figure 7.5.5.3.4-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set q_1 of the candidate beam used for link recovery.
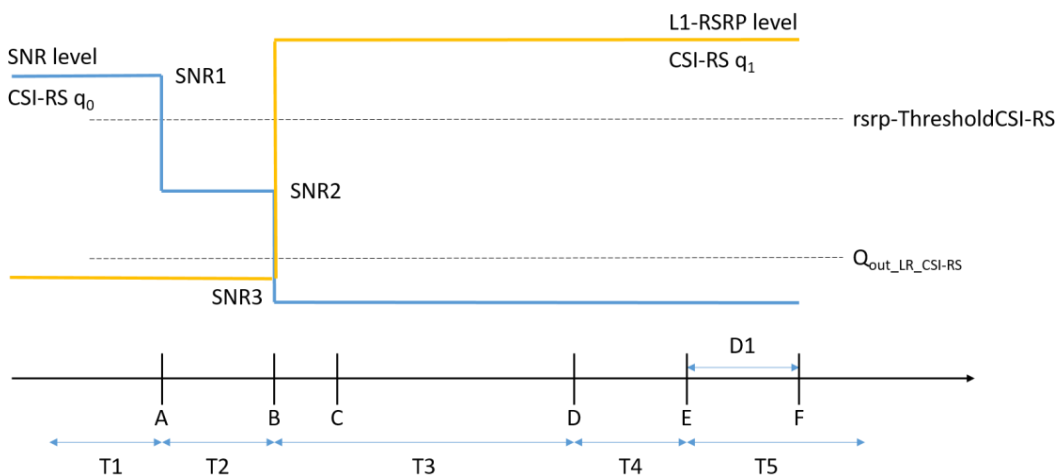
Figure 7.5.5.3.4-1: SNR and L1-RSRP variation for NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX

7.5.5.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.5.3.4.1-1.

Table 7.5.5.3.4.1-1: Supported test configurations for NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX

Configuration	Description
7.5.5.3-1	TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth

Configure the test equipment and the DUT according to the parameters in Table 7.5.5.3.4.1-2.

Table 7.5.5.3.4.1-2: Initial conditions for NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 7.5.5.3.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 7.5.5.3.4.1-3. The NZP-CSI-RS configuration is according to Table 7.5.5.3.4.1-3.

2. Message contents are defined in clause 7.5.5.3.4.3.

3. There is one NR carrier and one NR cells specified in the test. Cell 1 is the NR cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.5.5.3.4.1-3: General test parameters for NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX

Parameter	Test Config.	Unit	Value	Comment
			Test 1	

		1		Cell 1	
Active PCell		1		Cell 1	
RF Channel Number		1		1	
Duplex mode		1		TDD	
TDD Configuration		1		TDDConf.3.1	Table A.1.5-3
BW$_{channel}$		1	MHz	100: N$_{RB,c}$ = 66	
Data RBs allocated		1		66	
PDSCH/PDCCH subcarrier spacing		1	kHz	120	
DL initial BWP configuration		1		DLBWP.0.1	Table A.8.1-1
DL dedicated BWP configuration		1		DLBWP.1.1	Table A.8.1-2
UL initial BWP configuration		1		ULBWP.0.1	Table A.8.2-1
UL dedicated BWP configuration		1		ULBWP.1.1	Table A.8.2-2
PDSCH Reference Channel		1		SR.3.2 TDD	Table A.1.1.2-3
RMSI CORESET Reference Channel		1		CR.3.1 TDD	Table A.1.2.2-3
Dedicated CORESET Reference Channel		1		CCR.3.1 TDD	Table A.1.3.2-3
OCNG parameters		1		OP.1	Table A.2.1-1
CP length		1		Normal	
PDSCH/PDCCH TCI state		1		TCI.State.0	Table A.10.2-1
CSI-RS for tracking		1		TRS.2.1 TDD	Table A.1.4A.2.1-1
SSB Configuration		1		SSB.1 FR2	Table A.3.2-1
SMTC Configuration		1		SMTC.3	Table A.4-1
PRACH Configuration		1		PRACH.4 FR2	Table A.7.2-1
DRX configuration		1		OFF	
CSI-RS configuration for BFD/CBD/RLM		1		CSI-RS.3.2 TDD	Table A.1.4.2-3
CSI-RS index assigned as BFD RS (q$_0$)		1		0	
CSI-RS index assigned as CBD RS (q$_1$)		1		1	
CSI-RS index assigned as RLM RS		1		0,1	
Beam failure detection transmission parameters	DCI format	1		1-0	
	Number of Control OFDM symbols	1		2	
	Aggregation level	1	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	1	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	1	dB	0	
	DMRS precoder granularity	1		REG bundle size	
	REG bundle size	1		6	

Gap pattern ID	1		N/A	
rlmInSyncOutOfSyncThreshold	1		absent	Value 0 is applied. (TS 38.133 [6] Table 8.1.1-1).
rsrp-ThresholdSSB	1	dBm/SCS	-109[Note 2]	Threshold used for $Q_{in\_LR\_SSB}$
powerControlOffsetSS	1		db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMaxCount	1		n1	see TS 38.321 [12], clause 5.17
beamFailureDetectionTimer	1		pbfd4	see TS 38.321 [12], clause 5.17
CSI-RS configuration for CSI reporting	1		CSI-RS.3.1 TDD	Table A.1.4.2-3
reportConfigType	1		periodic	
reportQuantity	1		cri-RI-PMI-CQI	
CSI reporting periodicity	1	slot	40	
CSI reporting offset	1	slot	4	
T310	1	ms	1000	
N310	1		2	
T1	1	s	1	The UE shall be fully synchronized to cell 1 during T1
T2	1	s	1.17	
T3	1	s	0.9	
T4	1	s	0	
T5	1	s	0.31	
D1	1	s	0.27	
Note 1: UE-specific PDCCH is not transmitted after T1 starts.				
Note 2: Including test tolerance given in Annex F.1.3.2.				

7.5.5.3.4.2 Test procedure

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

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

2. Set the parameters of NR Cell 1 according to T1 in Table 7.5.5.3.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.5.3.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.5.3.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 7.5.5.3.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 7.5.5.3.5-1. T5 starts.

7. If the SS:

   a) detects uplink power on NR carrier in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point A to time point B; and

   b) does not detect a preamble on a beam associated with candidate beam set q_1 before time point B; and

   c) detects preamble on a beam associated with candidate beam set q_1 beforetime point F (D1 after the start of T5),

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

8. When T5 expires the SS shall change the SNR value to T1 as specified in Table 7.5.5.3.5-1.

9. Wait 1s for the UE to re-establish the connection or continue directly to step 10. If the UE re-establishes the connection within 1s continue to step 11. Otherwise continue to step 10.

10. Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

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

7.5.5.3.4.3 Message contents

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

Table 7.5.5.3.4.3-1: Common Exception messages for NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-8 with Condition CSI-RS BFD Table H.3.1-10 with Condition CSI-RS Table H.3.1-10A

7.5.5.3.5 Test requirement

Tables 7.5.5.3.4.1-3 and 7.5.5.3.5-1 define the primary level settings including test tolerances for NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX.

Table 7.5.5.3.5-1: NR Cell specific test parameters for NR SA FR2 CSI-RS-based beam failure detection and link recovery in non-DRX

Parameter		Unit	Test 1				
			T1	T2	T3	T4	T5
AoA setup			Setup 1 defined in A.9				
Assumption for UE beams [Note 10]			Rough				
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_CSI-RS of set q_0	Config 1	dB	13.7 [Note 11,12]	13.7 [Note 11,12]	-12	-12	-12
SNR_CSI-RS of set q_1	Config 1	dB	0.2	0.2	20 [Note 12]	20 [Note 12]	20 [Note 12]
CSI-RS_RP of set q_1	Config 1	dBm/SCS	-104.5	-104.5	-84.7	-84.7	-84.7
N_{oc}	Config 1	dBm/120 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: Void							
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 REs carrying CSI-RS.							
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 7.5.5.3.4-1.							
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 D.4.							
Note 10: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation.							
Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband.							
Note 12: Including test tolerance given in Annex F.1.3.2.							

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 =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%.

7.5.5.4 NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX

Editor's Note: This test case is complete for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

7.5.5.4.1 Test purpose

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set q_0 configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set q_1, and 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 TS 38.133 [6] clause 8.5.

7.5.5.4.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting 5GS NR SA FR2 and CSI-RS-based RLM and link recovery and long DRX cycle.

7.5.5.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.5.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.5.4.

7.5.5.4.4 Test description

There is one NR serving cell configured in this test. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 7.5.5.4.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate CSI-RS based beam failure. Figure 7.5.5.4.4-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set q_1 of the candidate beam used for link recovery.
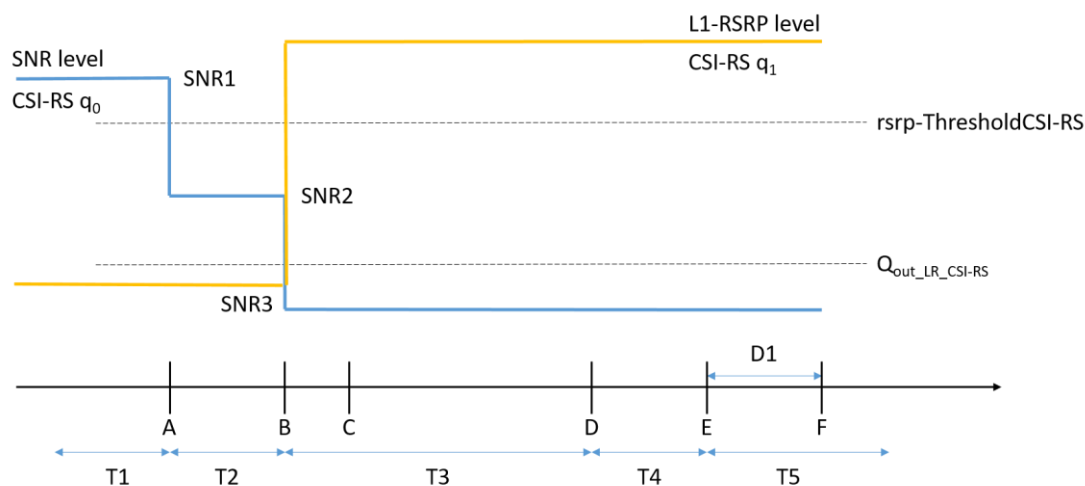
**Figure 7.5.5.4.4-1: SNR and L1-RSRP variation for NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX**

7.5.5.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.5.4.4.1-1.

Table 7.5.5.4.4.1-1: Supported test configurations for NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX

Configuration	Description
7.5.5.4-1	TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth

Configure the test equipment and the DUT according to the parameters in Table 7.5.5.4.4.1-2.

Table 7.5.5.4.4.1-2: Initial conditions for NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 6.5.5.3.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 7.5.5.4.4.1-3. The NZP-CSI-RS configuration is according to Table 7.5.5.4.4.1-3. The DRX configuration for is according to Table 7.5.5.4.4.1-3. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

2. Message contents are defined in clause 7.5.5.4.4.3.

3. There is one NR carrier and one NR cells specified in the test. Cell 1 is the NR cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.5.5.4.4.1-3: General test parameters for NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX

Parameter	Test Config.	Unit	Value	Comment
			Test 1	

Active PCell		1		Cell 1	
RF Channel Number		1		1	
Duplex mode		1		TDD	
TDD Configuration		1		TDDConf.3.1	Table A.1.5-3
BW$_{channel}$		1	MHz	100: N$_{RB,c}$ = 66	
Data RBs allocated		1		66	
PDSCH/PDCCH subcarrier spacing		1	kHz	120	
DL initial BWP configuration		1		DLBWP.0.1	Table A.8.1-1
DL dedicated BWP configuration		1		DLBWP.1.1	Table A.8.1-2
UL initial BWP configuration		1		ULBWP.0.1	Table A.8.2-1
UL dedicated BWP configuration		1		ULBWP.1.1	Table A.8.2-2
PDSCH Reference Channel		1		SR.3.2 TDD	Table A.1.1.2-3
RMSI CORESET Reference Channel		1		CR.3.1 TDD	Table A.1.2.2-3
Dedicated CORESET Reference Channel		1		CCR.3.1 TDD	Table A.1.3.2-3
OCNG parameters		1		OP.1	Table A.2.1-1
CP length		1		Normal	
PDSCH/PDCCH TCI state		1		TCI.State.0	Table A.10.2-1
CSI-RS for tracking		1		TRS.2.1 TDD	Table A.1.4A.2.1-1
SSB Configuration		1		SSB.1 FR2	Table A.3.2-1
SMTC Configuration		1		SMTC.3	Table A.4-1
PRACH Configuration		1		PRACH.4 FR2	Table A.7.2-1
DRX configuration		1		DRX.3	Table A.5-1
CSI-RS configuration for BFD/CBD/RLM		1		CSI-RS.3.2 TDD	Table A.1.4.2-3
CSI-RS index assigned as BFD RS (q$_0$)		1		0	
CSI-RS index assigned as CBD RS (q$_1$)		1		1	
CSI-RS index assigned as RLM RS		1		0,1	
Beam failure detection transmission parameters	DCI format	1		1-0	
	Number of Control OFDM symbols	1		2	
	Aggregation level	1	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	1	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	1	dB	0	
	DMRS precoder granularity	1		REG bundle size	
	REG bundle size	1		6	

Gap pattern ID	1		N/A	
rlmInSyncOutOfSyncThreshold	1		absent	Value 0 is applied. (TS 38.133 [6] Table 8.1.1-1).
rsrp-ThresholdSSB	1	dBm/SCS	-109[Note 2]	Threshold used for $Q_{in\_LR\_SSB}$
powerControlOffsetSS	1		db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMaxCount	1		n1	see TS 38.321 [12], clause 5.17
beamFailureDetectionTimer	1		pbfd4	see TS 38.321 [12], clause 5.17
CSI-RS configuration for CSI reporting	1		CSI-RS.3.1 TDD	Table A.1.4.2-3
reportConfigType	1		periodic	
reportQuantity	1		cri-RI-PMI-CQI	
CSI reporting periodicity	1	slot	40	
CSI reporting offset	1	slot	4	
T310	1	ms	1000	
N310	1		2	
T1	1	s	1	The UE shall be fully synchronized to cell 1 during T1
T2	1	s	5.43	
T3	1	s	5.16	
T4	1	s	0	
T5	1	s	0.31	
D1	1	s	0.27	
Note 1: UE-specific PDCCH is not transmitted after T1 starts. Note 2: Including test tolerance given in Annex F.1.3.2				

Table 7.5.5.4.4.1-4: Void

7.5.5.4.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to NR Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled.

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

2. Set the parameters of NR Cell 1 according to T1 in Table 7.5.5.4.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.5.4.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.5.4.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 7.5.5.4.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 7.5.5.4.5-1. T5 starts.

7. If the SS:

   a) detects uplink power on NR carrier in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point A to time point B; and

   b) does not detect preamble on a beam associated with candidate beam set q_1 before time point B; and

   c) detects preamble on a beam associated with candidate beam set q_1 before time point F (D1 after the start of T5),

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

8.   When T5 expires the SS shall change the SNR value to T1 as specified in Table 7.5.5.4.5-1.

9.   Wait 1s for the UE to re-establish the connection or continue directly to step 10. If the UE re-establishes the connection within 1s continue to step 11. Otherwise continue to step 10.

10.   Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

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

7.5.5.4.4.3   Message contents

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

Table 7.5.5.4.4.3-1: Common Exception messages for NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-8 with Condition CSI-RS BFD Table H.3.1-10 with Condition CSI-RS Table H.3.1-10A Table H.3.7-1 with Condition DRX.3

7.5.5.4.5   Test requirement

Tables 7.5.5.4.4.1-3 and 7.5.5.4.5-1 define the primary level settings including test tolerances for NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX.

Table 7.5.5.4.5-1: NR Cell specific test parameters for NR SA FR2 CSI-RS-based beam failure detection and link recovery in DRX

Parameter		Unit	Test 1				
			T1	T2	T3	T4	T5
AoA setup			Setup 1 defined in A.9				
Assumption for UE beams [Note 10]			Rough				
EPRE ratio of PDCCH DMRS to SSS		dB	0				
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					
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_CSI-RS of set q_0	Config 1	dB	13.7 [Note 11,12]	5.7 [Note 11,12]	-12	-12	-12
SNR_CSI-RS of set q_1	Config 1	dB	0.2	0.2	20 [Note 12]	20 [Note 12]	20 [Note 12]
CSI-RS_RP of set q_1	Config 1	dBm/SCS	-104.5	-104.5	-84.7	-84.7	-84.7
N_{oc}	Config 1	dBm/120 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: Void
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 REs carrying CSI-RS.
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 7.5.5.4.4-1.
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 D.4.
Note 10: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation.
Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband.
Note 12: Including test tolerance given in Annex F.1.3.2.

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 = 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%.

7.5.5.5 NR SA FR2 scheduling availability restriction during SSB-based beam failure detection and link recovery in non-DRX

Editor's Note: This test case is complete for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

7.5.5.5.1 Test purpose

The purpose of this test 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, and to verify the scheduling availability restriction requirements for SSB based beam failure detection and link recovery for an FR2 serving cell in TS 38.133 [6] clause 8.5.7 and 8.5.8.

7.5.5.5.2 Test applicability

This test applies to all types of NR UE release 15 onwards.

7.5.5.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.5.5.

7.5.5.5.4 Test description

There is one NR serving cell configured in this test. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 7.5.5.5.4-1 shows the variation of the downlink SNR of the SSB in set q0 in the active cell to emulate SSB based beam failure. Figure 7.5.5.5.4-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set q1 of the candidate beam used for link recovery.
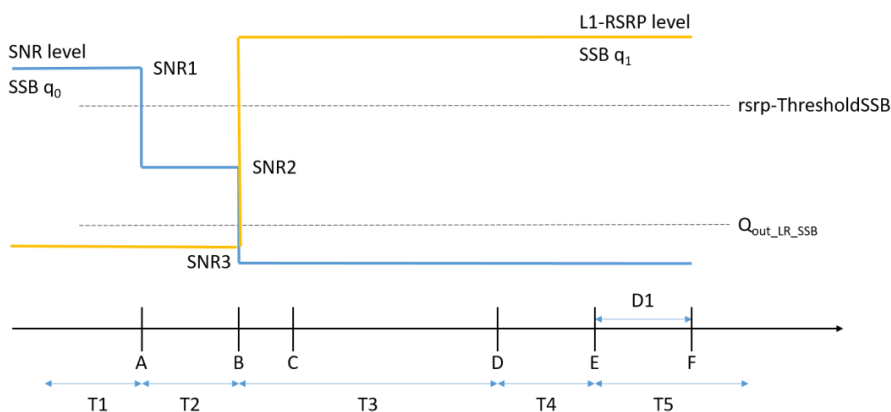
Figure 7.5.5.5.4-1: SNR and L1-RSRP variation for NR SA FR2 scheduling availability restriction during SSB-based beam failure detection and link recovery in non-DRX

7.5.5.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.5.5.4.1-1.

Table 7.5.5.5.4.1-1: Supported test configurations for NR SA FR2 scheduling availability restriction during SSB-based beam failure detection and link recovery in non-DRX

Configuration	Description
7.5.5.5-1	NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
7.5.5.5-2	NR 240 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
Note:	The UE is only required to be tested in one of the supported test configurations

Configure the test equipment and the DUT according to the parameters in Table 7.5.5.5.4.1-2.

Table 7.5.5.5.4.1-2: Initial conditions for NR SA FR2 scheduling availability restriction during SSB-based beam failure detection and link recovery in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 7.5.5.5.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 7.5.5.5.4.1-3.

2. Message contents are defined in clause 7.5.5.5.4.3.

3. There is one NR carrier and one NR cells specified in the test. Cell 1 is the NR cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.5.5.5.4.1-3: General test parameters for NR SA FR2 scheduling availability restriction during SSB-based beam failure detection and link recovery in non-DRX

Parameter	Test Config.	Unit	Value	Comment
			Test 1	
Active PCell	1-2		Cell 1	
RF Channel Number	1-2		1	
Duplex mode	1-2		TDD	
TDD Configuration	1-2		TDDConf.3.1	Table A.1.5-3
BW$_{channel}$	1-2	MHz	100: N$_{RB,c}$ = 66	
Data RBs allocated	1-2		66	
PDSCH/PDCCH subcarrier spacing	1-2	kHz	120	
DL initial BWP configuration	1-2		DLBWP.0.1	Table A.8.1-1
DL dedicated BWP configuration	1-2		DLBWP.1.1	Table A.8.1-2
UL initial BWP configuration	1-2		ULBWP.0.1	Table A.8.2-1
UL dedicated BWP configuration	1-2		ULBWP.1.1	Table A.8.2-2
PDSCH Reference Channel	1		SR.3.2 TDD	Table A.1.1.2-3
	2		SR.3.3 TDD	
RMSI CORESET Reference Channel	1		CR.3.1 TDD	Table A.1.2.2-3
	2		CR.3.2 TDD	
Dedicated CORESET Reference Channel	1		CCR.3.1 TDD	Table A.1.3.2-3
	2		CCR.3.7 TDD	
OCNG parameters	1-2		OP.1	Table A.2.1-1
CP length	1-2		Normal	
PDSCH/PDCCH TCI state	1-2		TCI.State.0	Table A.10.2-1
CSI-RS for tracking	1-2		TRS.2.1 TDD	
SSB Configuration	1		SSB.1 FR2	Table A.3.2-1
	2		SSB.2 FR2	

SMTC Configuration		1-2		SMTC.1	Table A.4-1
PRACH Configuration		1-2		PRACH.2 FR2	Table A.7.2-1
DRX configuration		1-2		OFF	
SSB index assigned as BFD RS (q_0)		1-2		0	
SSB index assigned as CBD RS (q_1)		1-2		1	
Beam failure detection transmission parameters	DCI format	1-2		1-0	
	Number of Control OFDM symbols	1-2		2	
	Aggregation level	1-2	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	1-2	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	1-2	dB	0	
	DMRS precoder granularity	1-2		REG bundle size	
	REG bundle size	1-2		6	
Gap pattern ID		1-2		N/A	
rlmInSyncOutOfSyncThreshold		1-2		absent	Value 0 is applied. (TS 38.133 [6] Table 8.1.1-1).
rsrp-ThresholdSSB		1	dBm/SCS	-109 Note 3	Threshold used for $Q_{in\_LR\_SSB}$
		2		-106 Note 3	
powerControlOffsetSS		1-2		db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMaxCount		1-2		n1	see TS 38.321 [12], clause 5.17
beamFailureDetectionTimer		1-2		pbfd4	see TS 38.321 [12], clause 5.17
CSI-RS configuration for CSI reporting		1-2		CSI-RS.3.1 TDD	Table A.1.4.2-3
reportConfigType		1-2		periodic	
reportQuantity		1-2		cri-RI-PMI-CQI	
CSI reporting periodicity		1-2	slot	40	
CSI reporting offset		1-2	slot	4	
T310		1-2	ms	1000	
N310		1-2		2	
T1		1-2	s	1	The UE shall be fully synchronized to cell 1 during T1
T2		1-2	s	2.6	
T3		1-2	s	1.64	
T4		1-2	s	0	
T5		1-2	s	1.01	
D1		1-2	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. Note 3: Including test tolerance given in Annex F.1.3.2.					

7.5.5.5.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity 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. During the test the UE is scheduled to transmit continuously in UL.

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

2. Set the parameters of NR Cell 1 according to T1 in Table 7.5.5.5.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.5.5.5-1. T2 starts.

4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.5.5.5-1. T3 starts.

5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 7.5.5.5.5-1. T4 starts.

6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 7.5.5.5.5-1. T5 starts.

7. If the SS:

a) detects uplink power on NR carrier in each slot configured for CQI transmission (according CQI reporting on PUCCH) which are not overlapped with SSBs configured for beam failure detection during the period from time point B to time point D

and

b) detects uplink power on NR carrier in each slot configured for CQI transmission (according CQI reporting on PUCCH) during the period from time point D until T5 expires,

the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

8. When T5 expires the SS shall change the SNR value to T1 as specified in Table 7.5.5.5.5-1.

9. Wait 1s for the UE to re-establish the connection or continue directly to step 10. If the UE re-establishes the connection within 1s continue to step 11. Otherwise continue to step 10.

10. Switch the UE on and off. Ensure the UE is in RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

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

7.5.5.5.4.3 Message contents

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

Table 7.5.5.5.4.3-1: Common Exception messages for NR SA FR2 scheduling availability restriction during SSB-based beam failure detection and link recovery in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-8 with Condition SSB BFD Table H.3.1-10 with Condition SSB Table H.3.1-10A

7.5.5.5.5 Test requirement

Table 7.5.5.5.4.1-3 and 7.5.5.5.5-1 define the primary level settings including test tolerances for NR SA FR2 scheduling availability restriction during SSB-based beam failure detection and link recovery in non-DRX.

Table 7.5.5.5.5-1: NR Cell specific test parameters for NR SA FR2 scheduling availability restriction during SSB-based beam failure detection and link recovery in non-DRX

Parameter	Unit	Test 1				
		T1	T2	T3	T4	T5

AoA Setup			Setup1 defined in A.3.15.1				
Assumption for UE beams [Note 10]			Rough				
EPRE ratio of PDCCH DMRS to SSS		dB	0				
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					
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 set q_0	Config 1-2	dB	13.7 [Note 11,12]	5.7 [Note 11,12]	-12	-12	-12
SNR_SSB of set q_1	Config 1-2	dB	0.2	0.2	20 [Note 12]	20 [Note 12]	20 [Note 12]
SSB_RP of set q_1	Config 1	dBm/SCS kHz	-104.5	-104.5	-84.7 Note 12	-84.7 Note 12	-84.7 Note 12
	Config 2		-101.5	-101.5	-81.7 Note 12	-81.7 Note 12	-81.7 Note 12
N_{oc}	Config 1	dBm/120KHz	-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: Void
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 7.5.5.5.4-1.
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 D.4.
Note 10: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3 and does not limit UE implementation or test system implementation.
Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband.
Note 12: Including test tolerance given in Table F.1.3.2-4

The UE behaviour during time duration T3 follows the requirements defined in TS 38.133 [6] 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 TS 38.133 [6] 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.

7.5.5.6 NR SA FR2 Scell CSI-RS-based beam failure detection and link recovery in non-DRX

Editor's Note:

- This test case is incomplete for Test frequency f > 40.8 GHz

- This test case is incomplete for UE power class other than PC3.

7.5.5.6.1 Test purpose

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set q_0 configured for an active SCell and that the UE performs correct CSI-RS-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 SCell with *schedulingRequestID-BFR-SCell-r16* configuration, 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 SCell requirements in TS 38.133 [6] clause 8.5.

7.5.5.6.2 Test applicability

This test applies to all types of NR UE release 16 onwards supporting SCell BFR.

7.5.5.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.5.0.2 and 7.5.5.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.5.6.

7.5.5.6.4 Test description

There are two cells configured in this test. Cell 1 is the active PCell and Cell 2 is the active SCell. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 7.5.5.6.4-1 shows the variation of the downlink SNR of the CSI-RS in set q_0 in the active SCell to emulate CSI-RS based beam failure. Figure 7.5.5.6.4-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set q_1 of the candidate beam used for link recovery.
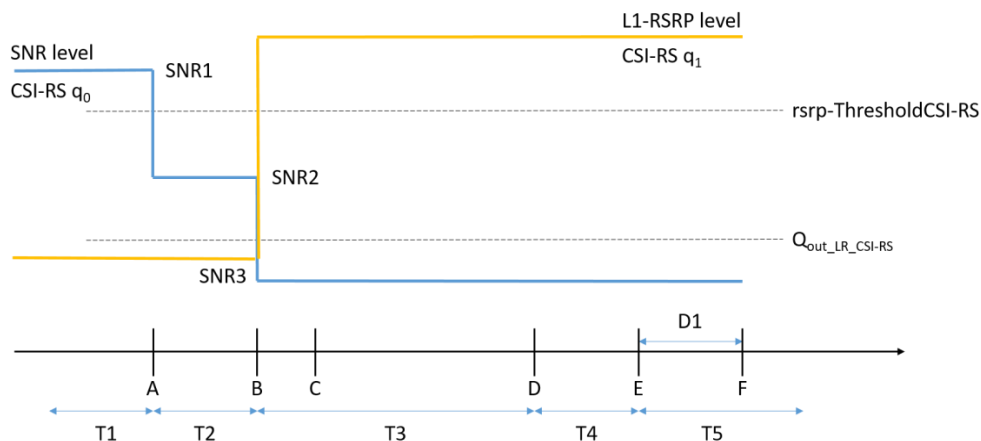
Figure 7.5.5.6.4-1: SNR and L1-RSRP variation for CSI-RS based beam failure detection and link recovery testing for SCell in non-DRX mode

7.5.5.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.5.6.4.1-1.

Table 7.5.5.6.4.1-1: Supported test configurations for SA FR2 SCell beam failure detection and link recovery testing in non-DRX

Configuration	Description
7.5.5.6-1	TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth
Note:	The UE is only required to be tested in one of the supported test configurations

Configure the test equipment and the DUT according to the parameters in Table 7.5.5.6.4.1-2.

Table 7.5.5.6.4.1-2: Initial conditions for SA FR2 SCell beam failure detection and link recovery testing in non-DRX

Parameter	Value			Comment
Test environment	NC			As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 4.3.1			
Channel bandwidth	As specified by the test configuration selected from Table 7.5.5.6.4.1-1.			
Propagation conditions	AWGN			As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1		As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1		
Exceptions to connection diagram	N/A			

1. The general test parameter settings are set up according to Table 7.5.5.6.4.1-3.

2. Message contents are defined in clause 7.5.5.6.4.3.

3. There are two NR cells specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.5.5.6.4.1-3: General test parameters for FR2 SCell for beam failure detection and link recovery testing in non-DRX mode

Parameter		Test Config.	Unit	Value	Comment
				Test 1	
Active PCell		1		Cell 1	
RF Channel Number for PCell		1		1	
Active SCell		1		Cell 2	
RF Channel Number for SCell		1		2	
Duplex mode		1		TDD	
TDD Configuration		1		TDDConf.3.1	
BW$_{channel}$		1	MHz	100: $N_{RB,c}$ = 66	
Data RBs allocated		1		66	
PDSCH/PDCCH subcarrier spacing		1	kHz	120	
DL initial BWP configuration		1		DLBWP.0.1	
DL dedicated BWP configuration		1		DLBWP.1.1	
UL initial BWP configuration		1		ULBWP.0.1	
UL dedicated BWP configuration		1		ULBWP.1.1	
PDSCH Reference Channel		1		SR.3.2 TDD	
RMSI CORESET Reference Channel		1		CR.3.1 TDD	A.1.2.2
Dedicated CORESET Reference Channel		1		CCR.3.1 TDD	
OCNG parameters		1		OP.1	A.2.1
CP length		1		Normal	
PDSCH/PDCCH TCI state		1		TCI.State.0	
CSI-RS for tracking		1		TRS.2.1 TDD	
SSB Configuration		1		SSB.3 FR2	A.3
SMTC Configuration		1		SMTC.3	A.4
PRACH Configuration		1		FR2 PRACH configuration 4	Table A.7.2-1
DRX configuration		1		OFF	
CSI-RS configuration for BFD/CBD on SCell		1		CSI-RS.3.2 TDD	A.1.4.2
CSI-RS index assigned as BFD RS (q$_0$)		1		0	
CSI-RS index assigned as CBD RS (q$_1$)		1		1	
CSI-RS configuration for RLM on PCell		1		CSI-RS.3.2 TDD	A.1.4.2
Beam failure detection transmission parameters	DCI format	1		1-0	
	Number of Control OFDM symbols	1		2	
	Aggregation level	1	CCE	8	

	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	1	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	1	dB	0	
	DMRS precoder granularity	1		REG bundle size	
	REG bundle size	1		6	
Gap pattern ID		1		N/A	
schedulingRequestID-BFR-SCell-r16		1		Configured	
Periodicity of PUCCH for SR configuration for BFR on SCell		1	slot	40	5ms
Offset of PUCCH for SR configuration for BFR on SCell		1	slot	4	
PUCCH parameters for SR configuration for BFR on SCell		1		Table 8.3.3.1.2-1 in [28]	
rlmInSyncOutOfSyncThreshold		1		absent	Value 0 is applied. (Table 8.1.1-1 in TS 38.133 [6]).
rsrp-ThresholdSSB		1	dBm/SCS	-109[Note 2]	Threshold used for $Q_{in\_LR\_SSB}$
powerControlOffsetSS		1		db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMaxCount		1		n1	see TS 38.321 [7], clause 5.17
beamFailureDetectionTimer		1		pbfd4	see TS 38.321 [7], clause 5.17
CSI-RS configuration for CSI reporting		1		CSI-RS.3.1 TDD	A.1.4.2
reportConfigType		1		periodic	
reportQuantity		1		cri-RI-PMI-CQI	
CSI reporting periodicity		1	slot	40	
CSI reporting offset		1	slot	4	
T310		1	ms	1000	
N310		1		2	
T1		1	s	1	The UE shall be fully synchronized to cell 1 during T1
T2		1	s	1.17	
T3		1	s	0.9	
T4		1	s	0	
T5		1	s	0.31	
D1		1	s	0.27	
Note 1: UE-specific PDCCH is not transmitted after T1 starts.					
Note 2: Including test toelerance given in Annex F.1.3.2					

7.5.5.6.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. In the test, DRX configuration is not enabled. During the test the UE is scheduled to transmit continuously in UL.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.4.

2. The SS shall configure SCell (Cell 2) on the SCC as per TS 38.508-1 [14] clause 7.5.2, with the message content exceptions defined in clause 7.5.5.6.4.3. NR RRCReconfiguration message is contained in RRCConnectionReconfiguration and NR RRCReconfigurationComplete message is contained in RRCConnectionReconfigurationComplete.

3. The SS activates SCC by sending the activation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10).

4. Set the parameters of NR Cell 1 and Cell 2 according to T1 in Table 7.5.5.6.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.5.6.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.5.6.5-1. T3 starts.

7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 7.5.5.6.5-1. T4 starts.

8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 7.5.5.6.5-1. T5 starts.

9. If the SS:

   a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-2 [18] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B; and

   b) does not detect PUCCH with LRR before time point B, and

   c) detects PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set q_1 before time point F (D1 after the start of T5),

   the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

10. When T5 expires the SS shall change the SNR value to T1 as specified in Table 7.5.5.6.5-1.

11. If the iteration fails, the SS shall first attempt to release and add the FR2 SCell. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration, and ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.4.

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

7.5.5.6.4.3 Message contents

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

Table 7.5.5.6.4.3-1: Common Exception messages for SA FR2 SCell for beam failure detection and link recovery testing in non-DRX mode

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-8 with Condition CSI-RS BFD Table H.3.1-12 on Cell 3 Table H.3.1-13 on Cell 3

Table 7.5.5.6.4.3-2: MAC-CellGroupConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-68			
Information Element	**Value/remark**	**Comment**	**Condition**
MAC-CellGroupConfig ::= SEQUENCE {			
scheduamlingRequestID-BFR-SCell-r16	SchedulingRequestId		
}			

Table 7.5.5.6.4.3-3: *SchedulingRequestResourceConfig*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-157			
Information Element	**Value/remark**	**Comment**	**Condition**
SchedulingRequestResourceConfig ::= SEQUENCE {			
periodicityAndOffset CHOICE {			
sl40	4		
}			
}			

7.5.5.6.5 Test requirement

Tables 7.5.5.6.4.1-3 and 7.5.5.6.5-1 define the primary level settings including test tolerances for SA FR2 SCell for beam failure detection and link recovery testing in non-DRX.

Table 7.5.5.6.5-1: NR Cell specific test parameters for SA FR2 SCell for beam failure detection and link recovery testing in non-DRX mode

Parameter		Unit	Cell1	Cell2 Test 1				
			T1 to T5	T1	T2	T3	T4	T5
AoA setup			Setup 1 defined in A.9.1	Setup 1 defined in A.9.1				
Assumption for UE beams[Note 10]			Rough	Rough				
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	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_CSI-RS of set q_0	Config 1	dB	5	13.7	5.7	-12	-12	-12
SNR_CSI-RS of set q_1	Config 1	dB	0.2	0.2	0.2	20	20	20
CSI-RS_RP of set q_1	Config 1	dBm/SCS kHz	-104.5	-104.5	-104.5	-84.7	-84.7	-84.7
N_{oc}	Config 1	dBm/120kHz	-104.7	-104.7				
Propagation condition			TDL-A 30ns 75Hz	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: Void								
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 REs carrying CSI-RS.								
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 7.5.5.6.4-1.								
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 D.4.								
Note 10: Information about types of UE beam is given in B.2.1.3 in TS 38.133 [6], and does not limit UE implementation or test system implementation								

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 initial link recovery. During T4 and T5 the UE measures and evaluates 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 PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set q_1. The UE shall not transmit PUCCH with an LRR 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%.

7.5.5.7 NR SA FR2 Scell CSI-RS-based beam failure detection and link recovery in DRX

Editor's Note:

- This test case is incomplete for Test frequency f > 40.8 GHz

- This test case is incomplete for UE power class other than PC3.

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 an active SCell and that the UE performs correct CSI-RS-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 SCell with *schedulingRequestID-BFR-SCell-r16* configuration, 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 SCell requirements in TS 38.133 [6] clause 8.5.

7.5.5.7.2 Test applicability

This test applies to all types of NR UE release 16 onwards supporting SCell BFR.

7.5.5.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.5.0.2 and 7.5.5.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.5.7.

7.5.5.7.4 Test description

There are two cells configured in this test. Cell 1 is the active PCell and Cell 2 is the active SCell. This test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 7.5.5.7.4-1 shows the variation of the downlink SNR of the CSI-RS in set q_0 in the active SCell to emulate CSI-RS based beam failure. Figure 7.5.5.7.4-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set q_1 of the candidate beam used for link recovery.
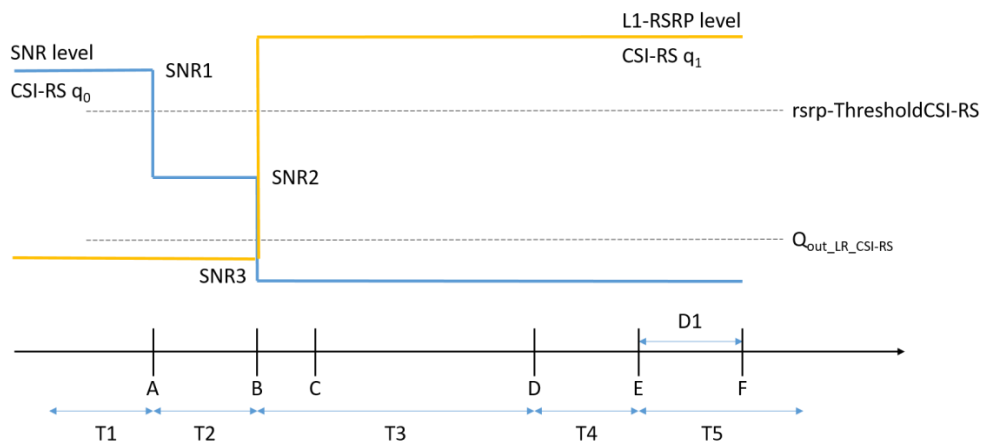
Figure 7.5.5.7.4-1: SNR and L1-RSRP variation for CSI-RS based beam failure detection and link recovery testing for SCell in DRX mode

7.5.5.7.4.1   Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.5.7.4.1-1.

Table 7.5.5.7.4.1-1: Supported test configurations for SA FR2 SCell beam failure detection and link recovery testing in DRX

Configuration	Description
7.5.5.7-1	TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth
Note:	The UE is only required to be tested in one of the supported test configurations

Configure the test equipment and the DUT according to the parameters in Table 7.5.5.7.4.1-2.

Table 7.5.5.7.4.1-2: Initial conditions for SA FR2 SCell beam failure detection and link recovery testing in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 4.3.1		
Channel bandwidth	As specified by the test configuration selected from Table 7.5.5.7.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 7.5.5.7.4.1-3.

2. Message contents are defined in clause 7.5.5.7.4.3.

3. There are two NR cells specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.5.5.7.4.1-3: General test parameters for FR2 SCell for beam failure detection and link recovery testing in DRX mode

Parameter	Test Config.	Unit	Value	Comment
			Test 1	

Active PCell		1		Cell 1	
RF Channel Number for PCell		1		1	
Active SCell		1		Cell 2	
RF Channel Number for SCell		1		2	
Duplex mode		1		TDD	
TDD Configuration		1		TDDConf.3.1	
BW$_{channel}$		1	MHz	100: N$_{RB,c}$ = 66	
Data RBs allocated		1		66	
PDSCH/PDCCH subcarrier spacing		1	kHz	120	
DL initial BWP configuration		1		DLBWP.0.1	
DL dedicated BWP configuration		1		DLBWP.1.1	
UL initial BWP configuration		1		ULBWP.0.1	
UL dedicated BWP configuration		1		ULBWP.1.1	
PDSCH Reference Channel		1		SR.3.2 TDD	
RMSI CORESET Reference Channel		1		CR.3.1 TDD	A.1.2.2
Dedicated CORESET Reference Channel		1		CCR.3.1 TDD	
OCNG parameters		1		OP.1	A.2.1
CP length		1		Normal	
PDSCH/PDCCH TCI state		1		TCI.State.0	
CSI-RS for tracking		1		TRS.2.1 TDD	
SSB Configuration		1		SSB.3 FR2	A.3
SMTC Configuration		1		SMTC.3	A.4
PRACH Configuration		1		FR2 PRACH configuration 4	Table A.7.2-1
DRX configuration		1		DRX.3	A.5
CSI-RS configuration for BFD/CBD on SCell		1		CSI-RS.3.2 TDD	A.1.4.2
CSI-RS index assigned as BFD RS (q$_0$)		1		0	
CSI-RS index assigned as CBD RS (q$_1$)		1		1	
CSI-RS configuration for RLM on PCell		1		CSI-RS.3.2 TDD	A.1.4.2
Beam failure detection transmission parameters	DCI format	1		1-0	
	Number of Control OFDM symbols	1		2	
	Aggregation level	1	CCE	8	
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	1	dB	0	
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	1	dB	0	
	DMRS precoder granularity	1		REG bundle size	
	REG bundle size	1		6	

Gap pattern ID	1		N/A	
schedulingRequestID-BFR-SCell-r16	1		Configured	
Periodicity of PUCCH for SR configuration for BFR on SCell	1	slot	40	5ms
Offset of PUCCH for SR configuration for BFR on SCell	1	slot	4	
PUCCH parameters for SR configuration for BFR on SCell	1		Table 8.3.3.1.2-1 in [28]	
rlmInSyncOutOfSyncThreshold	1		absent	Value 0 is applied. (Table 8.1.1-1 in TS 38.133 [6]).
rsrp-ThresholdSSB	1	dBm/SCS	-109[Note 2]	Threshold used for $Q_{in\_LR\_SSB}$
powerControlOffsetSS	1		db0	Used for deriving rsrp-ThresholdCSI-RS
beamFailureInstanceMaxCount	1		n1	see TS 38.321 [12], clause 5.17
beamFailureDetectionTimer	1		pbfd4	see TS 38.321 [12], clause 5.17
CSI-RS configuration for CSI reporting	1		CSI-RS.3.1 TDD	A.1.4.2
reportConfigType	1		periodic	
reportQuantity	1		cri-RI-PMI-CQI	
CSI reporting periodicity	1	slot	40	
CSI reporting offset	1	slot	4	
T310	1	ms	1000	
N310	1		2	
T1	1	s	1	The UE shall be fully synchronized to cell 1 during T1
T2	1	s	5.43	
T3	1	s	5.16	
T4	1	s	0	
T5	1	s	0.31	
D1	1	s	0.27	
Note 1: UE-specific PDCCH is not transmitted after T1 starts. Note 2: Including test toelerance given in Annex F.1.3.2				

7.5.5.7.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity 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. During the test the UE is scheduled to transmit continuously in UL.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.4.

2. The SS shall configure SCell (Cell 2) on the SCC as per TS 38.508-1 [14] clause 7.5.2, with the message content exceptions defined in clause 7.5.5.7.4.3. NR RRCReconfiguration message is contained in RRCConnectionReconfiguration and NR RRCReconfigurationComplete message is contained in RRCConnectionReconfigurationComplete.

3. The SS activates SCC by sending the activation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10).

4. Set the parameters of NR Cell 1 and Cell 2 according to T1 in Table 7.5.5.7.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 7.5.5.7.5-1. T2 starts.

6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 7.5.5.7.5-1. T3 starts.

7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 7.5.5.7.5-1. T4 starts.

8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 7.5.5.7.5-1. T5 starts.

9. If the SS:

   a) detects uplink power on NR carrier in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B; and

   b) does not detect PUCCH with LRR before time point B, and

   c) detects PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set q_1 before time point F (D1 after the start of T5),

   the number of successful tests is increased by one.

   Otherwise the number of failed tests is increased by one.

10. When T5 expires the SS shall change the SNR value to T1 as specified in Table 7.5.5.7.5-1.

11. If the iteration fails, the SS shall first attempt to release and add the FR2 SCell. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration, and ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *EN-DC*, DC bearer *MCG* and *SCG*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.4.

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

7.5.5.7.4.3 Message contents

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

Table 7.5.5.7.4.3-1: Common Exception messages for SA FR2 SCell for beam failure detection and link recovery testing in DRX mode

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-8 with Condition CSI-RS BFD
	Table H.3.1-12 on Cell 3
	Table H.3.1-13 on Cell 3
	Table H.3.7-1 with condition DRX.3

Table 7.5.5.7.4.3-2: MAC-CellGroupConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-68			
Information Element	**Value/remark**	**Comment**	**Condition**
MAC-CellGroupConfig ::= SEQUENCE {			
schedulingRequestID-BFR-SCell-r16	SchedulingRequestId		
}			

Table 7.5.5.7.4.3-3: *SchedulingRequestResourceConfig*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-157			
Information Element	**Value/remark**	**Comment**	**Condition**
SchedulingRequestResourceConfig ::= SEQUENCE {			
periodicityAndOffset CHOICE {			
sl40	4		
}			
}			

7.5.5.7.5 Test requirement

Tables 7.5.5.7.4.1-3 and 7.5.5.7.5-1 define the primary level settings including test tolerances for SA FR2 SCell for beam failure detection and link recovery testing in DRX.

Table 7.5.5.7.5-1: NR Cell specific test parameters for SA FR2 SCell for beam failure detection and link recovery testing in DRX mode

Parameter		Unit	Cell1	Cell2 Test 1				
			T1 to T5	T1	T2	T3	T4	T5
AoA setup			Setup 1 defined in A.9.1	Setup 1 defined in A.9.1				
Assumption for UE beams[Note 10]			Rough	Rough				
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	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_CSI-RS of set q_0	Config 1	dB	5	13.7	5.7	-12	-12	-12
SNR_CSI-RS of set q_1	Config 1	dB	0.2	0.2	0.2	20	20	20
CSI-RS_RP of set q_1	Config 1	dBm/SCS kHz	-104.5	-104.5	-104.5	-84.7	-84.7	-84.7
N_{oc}	Config 1	dBm/120kHz	-104.7	-104.7				
Propagation condition			TDL-A 30ns 75Hz	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: Void								
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 REs carrying CSI-RS.								
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure 7.5.5.7.4-1.								
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 D.4.								
Note 10: Information about types of UE beam is given in B.2.1.3 in TS 38.133 [6], and does not limit UE implementation or test system implementation								

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 initial link recovery. During T4 and T5 the UE measures and evaluates 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 PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set q_1. The UE shall not transmit PUCCH with an LRR 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%.

7.5.6 Active BWP switch delay

7.5.6.1 DCI-based and time-based active BWP switch

7.5.6.1.0 Minimum conformance requirements

[TS 38.133, clause 8.6.2]

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 $T_{BWPswitchDelay}$ 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.

Depending on UE capability *bwp-SwitchingDelay* [2], UE shall finish BWP switch within the time duration $T_{BWPswitchDelay}$ defined in Table 7.5.6.1.0-1.

Table 7.5.6.1.0-1: BWP switch delay

μ	NR Slot length (ms)	BWP switch delay $T_{BWPswitchDelay}$ (slots)	
		Type 1[Note 1]	Type 2[Note 1]
0	1	1	3
1	0.5	2	5
2	0.25	3	9
3	0.125	6	18
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.

7.5.6.1.1 NR SA FR2 DCI-based DL active BWP switch in non-DRX

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

- Test tolerance analysis is missing

- Message contents are TBD

- Cell mapping is TBD

- Test procedure is TBD

- Test applicability needs to be added to TS 38.522

7.5.6.1.1.1 Test purpose

FFS

7.5.6.1.1.2 Test applicability

FFS

7.5.6.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.6.1.1.

7.5.6.1.1.4 Test description

7.5.6.1.1.4.1 Initial conditions

FFS

7.5.6.1.1.4.2 Test procedure

FFS

7.5.6.1.1.4.3 Message contents

FFS

7.5.6.1.1.5 Test requirements

FFS

7.5.6.1.2 NR SA FR1-FR2 DCI-based DL active BWP switch in non-DRX

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

- Test tolerance analysis is missing

- Message contents are TBD

- Cell mapping is TBD

- Test procedure is TBD

- Test applicability needs to be added to TS 38.522

7.5.6.1.2.1 Test purpose

FFS

7.5.6.1.2.2 Test applicability

FFS

7.5.6.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.6.1.2.

7.5.6.1.2.4 Test description

7.5.6.1.2.4.1 Initial conditions

FFS

7.5.6.1.2.4.2 Test procedure

FFS

7.5.6.1.2.4.3 Message contents

FFS

7.5.6.1.2.5 Test requirements

FFS

7.5.6.1.3 NR SA FR2 DCI-based DL active BWP switch in non-DRX

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

- Test tolerance analysis is missing

- Message contents are TBD

- Cell mapping is TBD

- Test procedure is TBD

- Test applicability needs to be added to TS 38.522

7.5.6.1.3.1 Test purpose

The purpose of this test is to verify the DL BWP switch delay requirement defined in TS 38.133 [6] clause 8.6

7.5.6.1.3.2 Test applicability

This test applies to all types of NR UE release 15 onwards.

7.5.6.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.6.1.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.6.1.3.

7.5.6.1.3.4 Test description

There is one cell configured in this test. Cell 1 is PCell. This test consists of three successive time periods, with time duration of T1, T2 and T3 respectively.

7.5.6.1.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.5.6.1.3.4.1-1.

Table 7.5.6.1.3.4.1-1: Supported test configurations for NR SA FR2 DCI-based DL active BWP switch in non-DRX

Config	Description
7.5.6.1.3-1	NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
Note 1: A UE which fulfils the requirements in test case 7.5.6.1.1 or 7.5.6.1.2 can skip the test cases in 7.5.6.1.3.	

Configure the test equipment and the DUT according to the parameters in Table 7.5.6.1.3.4.1-2.

Table 7.5.6.1.3.4.1-2: Initial conditions for NR SA FR2 DCI-based DL active BWP switch in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 5.5.5.5.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.TBD	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 7.5.6.1.3.4.1-3.

2. Message contents are defined in clause 7.5.6.1.3.4.3.

3. There are one NR cell specified in the test. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.5.6.1.3.4.1-3: General test parameters for NR SA FR2 DCI-based DL active BWP switch in non-DRX

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]	

7.5.6.1.3.4.2   Test procedure

FFS

7.5.6.1.3.4.3   Message contents

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

Table 7.5.6.1.3.4.3-1: Common Exception messages for NR SA FR2 DCI-based DL active BWP switch in non-DRX

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

7.5.6.1.3.5   Test requirements

FFS

7.5.6.2   RRC-based active BWP switch

7.5.6.2.0   Minimum conformance requirements

FFS

7.5.6.2.1   NR SA FR2 RRC-based DL active BWP switch in non-DRX

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

- Test tolerance analysis is missing

- Message contents are TBD

- Cell mapping is TBD

- Test procedure is TBD

- Test applicability needs to be added to TS 38.522

7.5.6.2.1.1   Test purpose

FFS

7.5.6.2.1.2   Test applicability

FFS

7.5.6.2.1.3   Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.5.6.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.6.2.1.

7.5.6.2.1.4   Test description

7.5.6.2.1.4.1   Initial conditions

FFS

7.5.6.2.1.4.2   Test procedure

FFS

7.5.6.2.1.4.3   Message contents

FFS

7.5.6.2.1.5   Test requirements

FFS

7.5.7   PSCell addition and release delay

7.5.7.0   Minimum conformance requirements

7.5.7.0.1   Minimum conformance requirements for PSCell addition delay

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 $n + T_{config\_PSCell}$:

Where:

$$T_{config\_PSCell} = T_{RRC\_delay} + T_{processing} + T_{search} + T_\Delta + T_{PSCell\_DU} + 2 \text{ ms}$$

T_{RRC_delay} is the RRC procedure delay as specified in TS 38.331 [13].

$T_{processing}$ 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 Ês/Iot ≥ -2dB, $T_{search} = 24*$ Trs ms.

T_Δ 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_{PSCell_DU} is the delay uncertainty in acquiring the first available PRACH occasion in the PSCell. T_{PSCell_DU} is up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in Table 8.1-1 of TS 38.213 [8].

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 TS 38.133 [6] clause 9.3.

- One of the SSBs measured from PSCell being configured also remains detectable during the PSCell configuration delay T_{config_PSCell} according to the cell identification conditions specified in TS 38.133 [6] clause 9.3.

otherwise it is unknown.

The PCell interruption specified in TS 38.133 [6] clause 8.2 is allowed only during the RRC reconfiguration procedure in TS 38.331 [13].

The normative reference for this requirement is TS 38.133 [6] clause 8.9.2.

7.5.7.0.2 Minimum conformance requirements for PSCell release delay

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 [13] no later than in subframe $n+ T_{RRC\_delay}$:

Where

T_{RRC_delay} is the RRC procedure delay as specified in TS 38.331 [13].

The PCell interruption specified in TS 38.133 [6] clause 8.2 is allowed only during the RRC reconfiguration procedure in TS 38.331 [13].

The normative reference for this requirement is TS 38.133 [6] clause 8.9.3.

7.5.7.1 NR SA FR2 addition and release delay of known PSCell

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

- Test procedure

- Connection diagram

- Message contents are not complete.

- Test Requirements (still brackets in core-spec for PRACH preamble time [112] ms and CSI report time [20] ms)

- TT analysis is missing.

- Test Applicability in TS38.522

- Annex F

- Cell configuration mapping in Annex E

7.5.7.1.1   Test purpose

The purpose of this test is:

- To verify the requirement for the PSCell addition and release delay are within the requirements specified in TS 38.133 [6] clause 8.9.2, when the PSCell is known to the UE at the time of addition.

7.5.7.1.2   Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.5.7.1.3   Minimum conformance requirements

The minimum conformance requirements are specified in clauses 7.5.7.0.1 and 7.5.7.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.7.1.

7.5.7.1.4   Test description

7.5.7.1.4.1   Initial conditions

This test shall be run in one of the configurations defined in Table 7.5.7.1.4.1-1.

Table 7.5.7.1.4.1-1: Supported test configurations for NR SA 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	

Configure the test equipment and the DUT according to the parameters in Table 7.5.7.1.4.1-2.

Table 7.5.7.1.4.1-2: Initial conditions for NR SA FR2 SCell activation case

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.5.7.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	TBD	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 7.5.7.1.4.1-3.

2. Message contents are defined in clause 7.5.7.1.4.3.

3. There are two NR carriers and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is the neighbour cell (PSCell-to-be). Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

Table 7.5.7.1.4.1-3: General test parameters for NR SA FR2 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
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
Measurement gap pattern ID			0	Gaps are configured before T2 and released before T3.
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 shall identify neighbour cell 2 and report event B1.
T3		s	1	During this time the UE adds the PSCell.
T4		s	1	During this time the UE sends CSI reports for PSCell.
T5		s	1	During this time the UE releases the PSCell.

7.5.7.1.4.2   Test procedure

TBD

7.5.7.1.4.3   Message contents

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

Table 7.5.7.1.4.3-1: Common Exception messages

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

7.5.7.1.5   Test requirement

TBD

7.5.7.2   NR SA FR2 addition and release delay of unknown PSCell

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

- Test procedure

- Connection diagram

- Message contents are not complete

- Test Requirements (still brackets in core-spec for PRACH preamble time [572] ms and CSI report time [20] ms)

- TT analysis is missing

- Test Applicability in TS38.522

- Annex F

- Cell configuration mapping in Annex E

7.5.7.2.1 Test purpose

The purpose of this test is:

- To verify the requirement for the PSCell addition and release delay are within the requirements specified in TS 38.133 [6] clause 8.9.2, when the PSCell is unknown to the UE at the time of addition.

7.5.7.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.5.7.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clauses 7.5.7.0.1 and 7.5.7.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.5.7.2.

7.5.7.2.4 Test description

7.5.7.2.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 7.5.7.2.4.1-1.

Table 7.5.7.2.4.1-1: Supported test configurations for NR SA 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	

Configure the test equipment and the DUT according to the parameters in Table 7.5.73.2.4.1-2.

Table 7.5.7.2.4.1-2: Initial conditions for NR SA FR2 PSCell addition and release delay

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.5.3.7.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	TBD	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	TBD	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 7.5.7.2.4.1-3.

2. Message contents are defined in clause 7.5.7.2.4.3.

3. There are two NR carriers and 2 NR Cells specified in the test. Cell 1 is the PCell and Cell 2 is the neighbour cell (PSCell-to-be). Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

Table 7.5.7.2.4.1-3: General test parameters for NR SA FR2 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.
T3	s	1	During this time the UE sends CSI reports for PSCell.
T4	s	1	During this time the UE releases the PSCell.

7.5.7.2.4.2 Test procedure

TBD

7.5.7.2.4.3 Message contents

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

Table 7.5.7.2.4.3-1: Common Exception messages

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

7.5.7.2.5 Test requirement

TBD

7.6 Measurement procedures

7.6.1 Intra-frequency measurements

7.6.1.0 Minimum conformance requirements

7.6.1.0.1 Minimum conformance requirements for event-triggered measurement without gap

[TS 38.133, clause 9.2.5.1 and 9.2.5.2]

The UE shall be able to identify a new detectable intra frequency cell within $T_{identify\_intra\_without\_index}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index(*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE has been indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). The UE shall be able to identify a new detectable intra frequency SS block of an already detected cell within $T_{identify\_intra\_without\_index}$. It is assumed that *deriveSSB-IndexFromCell* is always enabled for FR1 TDD and FR2.

$$T_{identify\_intra\_without\_index} = (T_{PSS/SSS\_sync\_intra} + T_{SSB\_measurement\_period\_intra}) \text{ ms}$$

Where:

T_{PSS/SSS_sync_intr}: it is the time period used in PSS/SSS detection given in table 7.6.1.0.1-1.

$T_{SSB\_measurement\_period\_intra}$: equal to a measurement period of SSB based measurement given in table 7.6.1.0.1-2.

$CSSF_{intra}$: it is a carrier specific scaling factor and is determined according to $CSSF_{outside\_gap,i}$ in TS 38.133 [6] clause 9.1.5.1 for measurement conducted outside measurement gaps.

$M_{pss/sss\_sync\_w/o\_gaps}$: 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, $M_{pss/sss\_sync\_w/o\_gaps} = 24$

$M_{meas\_period\_w/o\_gaps}$: 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

For FR2 when any of the reference signals configured for RLM, BFD, CBD or L1-RSRP for beam reporting outside measurement gap is fully overlapping with intra-frequency SMTC, $K_{layer1\_measurement}= 1.5$, otherwise $K_{layer1\_measurement}=1$.

Table 7.6.1.0.1-1: Time period for PSS/SSS detection (Frequency range FR2)

DRX cycle	T_{PSS/SSS_sync_intra}
No DRX	max(600ms, ceil($M_{pss/sss\_sync\_w/o\_gaps}$ x K_p x $K_{layer1\_measurement}$) x SMTC period)[Note 1] x $CSSF_{intra}$
DRX cycle≤ 320ms	max(600ms, ceil(1.5 x $M_{pss/sss\_sync\_w/o\_gaps}$ x K_p x $K_{layer1\_measurement}$) x max(SMTC period, DRX cycle)) x $CSSF_{intra}$
DRX cycle>320ms	ceil($M_{pss/sss\_sync\_w/o\_gaps}$ x K_p x $K_{layer1\_measurement}$) x DRX cycle x $CSSF_{intra}$
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified	

Table 7.6.1.0.1-2: Measurement period for intra-frequency measurements without gaps (Frequency FR2)

DRX cycle	$T_{SSB\_measurement\_period\_intra}$
No DRX	max(400ms, ceil($M_{meas\_period\_w/o\_gaps}$ x K_p x $K_{layer1\_measurement}$) x SMTC period)[Note 1] x $CSSF_{intra}$
DRX cycle≤ 320ms	max(400ms, ceil(1.5x $M_{meas\_period\_w/o\_gaps}$ x K_p x $K_{layer1\_measurement}$) x max(SMTC period, DRX cycle)) x $CSSF_{intra}$
DRX cycle>320ms	ceil($M_{meas\_period\_w/o\_gaps}$ xK_p x $K_{layer1\_measurement}$) x DRX cycle x $CSSF_{intra}$
NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified	

[TS 38.133, clause 9.2.4.3]

Reported RSRP, RSRQ, and RS-SINR measurements contained in periodically triggered measurement reports shall meet the requirements in TS 38.133 [6] clause 10.1.2.1, 10.1.7.1 and 10.1.12.1, respectively.

The UE shall not send any event triggered measurement reports, as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x TTI_{DCCH}.This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than $T_{\text{identify intra without index}}$ defined in TS 38.133 [6] clause 9.2.5.1. When L3 filtering is used an additional delay can be expected.

If a cell which has been detectable at least for the time period than $T_{\text{identify intra without index}}$ defined in TS 38.133 [6] clause 9.2.5.1 becomes undetectable for a period and then the cell becomes detectable again and triggers an event, the event triggered measurement reporting delay shall be less than $T_{\text{Measurement\_Period, Intra}}$ provided the timing to that cell has not changed more than ± 3200 Tc while the measurement gap has not been available and the L3 filter has not been used. When L3 filtering is used, an additional delay can be expected.

[TS 38.133, clause 9.2.2]

The requirements given above apply, provided:

- The cell being identified or measured is detectable.

An intra-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in TS 38.133 [6] sections 10.1.2 are fulfilled for a corresponding Band,

- SS-RSRQ related side conditions given in TS 38.133 [6] sections 10.1.7 are fulfilled for a corresponding Band,

- SS-SINR related side conditions given in TS 38.133 [6] sections 10.1.12 are fulfilled for a corresponding Band,

- SSB_RP and SSB Ês/Iot according to TS 38.133 [6] Annex B.2.2 for a corresponding Band.

References: The conformance requirements covered in the current TC are specified in: TS 38.133 [6], clauses 9.2.2, 9.2.4.3, 9.2.5.1 and 9.2.5.2.

7.6.1.0.2   Minimum conformance requirements for event-triggered measurement with gap

[TS 38.133 [6], clause 9.2.6.2, 9.2.6.3]

The UE shall be able to identify a new detectable intra frequency cell within $T_{\text{identify\_intra\_without\_index}}$ if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE has been indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). It is assumed that *deriveSSB-IndexFromCell* is always enabled for FR1 TDD and FR2.

$$T_{\text{identify\_intra\_without\_index}} = T_{\text{PSS/SSS\_sync\_intra}} + T_{\text{SSB\_measurement\_period\_intra}} \text{ ms}$$

Where:

$T_{\text{PSS/SSS\_sync\_intra}}$: it is the time period used in PSS/SSS detection given in table 7.6.1.0.2-1.

$T_{\text{SSB\_measurement\_period\_intra}}$: equal to a measurement period of SSB based measurement given in table 7.6.1.0.2-2.

$CSSF_{\text{intra}}$: it is a carrier specific scaling factor and is determined according to $CSSF_{\text{within\_gap,i}}$ in TS 38.133 [6] section 9.1.5.2.2 for measurement conducted within measurement gaps.

$M_{\text{pss/sss\_sync\_with\_gaps}}$: For a UE supporting FR2 power class 1, $M_{\text{pss/sss\_sync with\_gaps}}=40$. For a UE supporting FR2 power class 2, $M_{\text{pss/sss\_sync with\_gaps}} =24$. For a UE supporting FR2 power class 3, $M_{\text{pss/sss\_sync with\_gaps}} =24$. For a UE supporting power class 4, $M_{\text{pss/sss\_sync with\_gaps}} =24$

$M_{\text{meas\_period\_ with\_gaps}}$: For a UE supporting power class 1, $M_{\text{meas\_period\_ with\_gaps}} =40$. For a UE supporting power class 2, $M_{\text{meas\_period\_ with\_gaps}} =24$. For a UE supporting power class 3, $M_{\text{meas\_period\_ with\_gaps}} =24$. For a UE supporting power class 4, $M_{\text{meas\_period with\_gaps}} =24$.

Table 7.6.1.0.2-1: Time period for PSS/SSS detection (Frequency range FR2)

DRX cycle	$T_{\text{PSS/SSS\_sync\_intra}}$
No DRX	max(600ms, $M_{\text{pss/sss\_sync\_with\_gaps}}$ x max(MGRP, SMTC period)) x $CSSF_{\text{intra}}$
DRX cycle≤ 320ms	max(600ms, ceil(1.5x $M_{\text{pss/sss\_sync\_with\_gaps}}$) x max(MGRP, SMTC period, DRX cycle)) x $CSSF_{\text{intra}}$
DRX cycle>320ms	$M_{\text{pss/sss\_sync\_with\_gaps}}$ x max(MGRP, DRX cycle) x $CSSF_{\text{intra}}$

Table 7.6.1.0.2-2: Measurement period for intra-frequency measurements with gaps (Frequency Range FR2)

DRX cycle	$T_{SSB\_measurement\_period\_intra}$
No DRX	$\max(400\text{ms}, M_{meas\_period\ with\_gaps} \times \max(\text{MGRP, SMTC period})) \times CSSF_{intra}$
DRX cycle $\leq$ 320ms	$\max(400\text{ms}, \text{ceil}(1.5 \times M_{meas\_period\ with\_gaps}) \times \max(\text{MGRP, SMTC period, DRX cycle}))^{\text{Note 1}} \times CSSF_{intra}$
DRX cycle>320ms	$M_{meas\_period\ with\_gaps} \times \max(\text{MGRP, DRX cycle}) \times CSSF_{intra}$

[TS 38.133 [6], clause 9.2.2]

The requirements given above apply, provided:

- The cell being identified or measured is detectable.

An intra-frequency cell shall be considered detectable when for each relevant SSB:

- SS-RSRP related side conditions given in TS 38.133 [6] sections 10.1.2 are fulfilled for a corresponding Band,

- SS-RSRQ related side conditions given in TS 38.133 [6] sections 10.1.7 are fulfilled for a corresponding Band,

- SS-SINR related side conditions given in TS 38.133 [6] Sections 10.1.12 are fulfilled for a corresponding Band,

- SSB_RP and SSB Ês/Iot according to TS 38.133 [6] Annex B.2.2 for a corresponding Band.

[TS 38.133 [6], clause 9.2.4.2]

The RSRP measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] clauses 10.1.2.1.1 and 10.1.2.1.2, the RSRQ measurement accuracy for all measured cells shall be as specified in TS 38.133 [6] clauses 10.1.7.1.1, and the SINR measurement accuracy for all measured cells shall be as specified in the TS 38.133 [6] clause 10.1.12.1.1.

Reported RSRP, RSRQ and SINR measurements contained in event triggered measurement reports shall meet the requirements in TS 38.133 [6] clauses 10.1.2.1.1, 10.1.2.1.2, 10.1.7.1.1 and 10.1.12.1.1, respectively.

The UE shall not send any event triggered measurement reports, as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x TTI_{DCCH}. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than $T_{identify\_intra\_without\_index}$ defined in TS 38.133 [6] section 9.2.6.2. When L3 filtering is used an additional delay can be expected.

The normative reference for this requirement is TS 38.133 [6] clauses 9.2.2, 9.2.4.2, 9.2.6.2 and 9.2.6.3.

7.6.1.1   NR SA FR2 event-triggered reporting without gap in non-DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f $\leq$ 40.8 GHz

- UE PC3

This test case is incomplete for UE power classes other than PC3

This test case is incomplete for test frequencies > 40.8 GHz

7.6.1.1.1   Test purpose

The purpose of this test is to verify the UE's ability to make a correct reporting of an event within intra-frequency cell search without gap under non-DRX. This test will partly verify the TDD intra-frequency cell search requirements defined in TS 38.133 clause 9.2.5.1 and 9.2.5.2

7.6.1.1.2   Test applicability

This test applies to all types of NR UE release 15 onwards.

7.6.1.1.3   Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.1.1.

7.6.1.1.4   Test description

7.6.1.1.4.1   Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.1.1.4.1-1.

Table 7.6.1.1.4.1-1: Supported test configurations for NR SA FR2 event-triggered reporting without gap in non-DRX

Test Case ID	Description
7.6.1.1-1	120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
7.6.1.1-2	240 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
Note:	The UE is only required to be tested in one of the supported test configurations.

Configure the test requirement and the DUT according to the parameters in Table 7.6.1.1.4.1-2.

Table 7.6.1.1.4.1-2: Initial conditions for NR SA FR2 event-triggered reporting without gap in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.6.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The test parameters for PCell and neighbour cell are given in Table 7.6.1.1.4.1-3 below.

2. Message contents are defined in clause 7.6.1.1.4.3.

3. There is one carrier and two cells specified in the test. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.6.1.1.4.1-3: General test parameters for NR SA FR2 event-triggered reporting without gap in non-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.
SMTC configuration		1, 2	SMTC.1	
A3-Offset	dB	1, 2	11	
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 cells
T1	s	1, 2	5	
T2	s	1, 2	5	

7.6.1.1.4.2 Test procedure

Two cells are deployed in the test, which are FR2 PCell (NR Cell 1) and a FR2 neighbour cell (NR Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 7.6.1.1.4.1-3 and Table 7.6.1.1.5-1, respectively. In the measurement control information a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 2.

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

2. Set the parameters according to T1 in Table 7.6.1.1.5-1. T1 starts.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit an *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.1.1.5-1. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than X ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one. Where X is

   - 2402 ms for UE supporting power class 1,

   - 1442 ms for UE supporting power class 2, 3 or 4,

7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall transmit an *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set NR Cell 2 physical cell identity = ((current NR Cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. After the RRC connection release, the SS:
   - transmits in NR Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),
   or
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

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

7.6.1.1.4.3   Message contents

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

Table 7.6.1.1.4.3-1: Common Exception messages for NR SA FR2 event-triggered reporting without gap in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.1-4 with A3-offset = -11dB Table H.3.1-7 with Condition INTRA-FREQ

7.6.1.1.5   Test requirement

Table 7.6.1.1.4.1-3, Table 7.6.1.1.5-1 and Table 7.6.1.1.5-2 define the primary level settings including test tolerances for NR SA FR2 event-triggered reporting without gap in non-DRX.

Table 7.6.1.1.5-1: NR Cell specific test parameters for NR SA FR2 event-triggered reporting without gap in non-DRX

Parameter	Unit	Config	Cell 1		Cell 2	
			T1	T2	T1	T2
TDD configuration		1, 2	TDDConf.3.1		TDDConf.3.1	
BW$_{channel}$	MHz	1, 2	100: N$_{RB,c}$ = 66		100: N$_{RB,c}$ = 66	
Data RBs allocated		1	24		24	
		2	48		48	
Initial BWP configuration		1, 2	DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1	
Active DL BWP configuration		1, 2	DLBWP.1.1		DLBWP.1.1	
Active UL BWP configuration		1, 2	ULBWP.1.1		ULBWP.1.1	
RLM-RS		1, 2	SSB		SSB	
PDSCH RMC configuration		1	SR.3.2 TDD		N/A	
		2	SR.3.3 TDD			
RMSI CORESET RMC configuration		1	CR.3.1 TDD		CR.3.1 TDD	
		2	CCR.3.7 TDD		CCR.3.7 TDD	
Dedicated CORESET RMC configuration		1, 2	CCR.3.1 TDD		CCR.3.1 TDD	
TRS configuration		1, 2	TRS.2.1 TDD		N/A	
PDSCH/PDCCH TCI states		1, 2	TCI.state.2		N/A	
PDSCH/PDCCH subcarrier spacing	kHz	1, 2	120		120	
OCNG Patterns		1, 2	OP.1		OP.1	
cellIndividualOffset	dB	1~2	N/A		16	
SSB		1	SSB.3 FR2		SSB.3 FR2	
		2	SSB.4 FR2		SSB.4 FR2	
Propagation Condition		1, 2	AWGN			

Table 7.6.1.1.5-2: NR OTA Cell specific test parameters for NR SA FR2 event-triggered reporting without gap in non-DRX

Parameter	Unit	Config	Cell 1		Cell 2	
			T1	T2	T1	T2
AoA setup		1, 2	Setup 3 defined in A.9.3			
			AoA1		AoA2	
Beam assumption[Note 4]		1,2	Rough		Rough	
E_s	dBm/SCS	1	-89		-89	
		2	-86		-86	
$\hat{E}_s / I_{ot}$ BB [Note 5]	dB	1, 2	-0.12	-0.12	-Infinity	-0.12
SSB_RP	dBm/SCS	1	-89	-89	-Infinity	-89
		2	-86	-86	-Infinity	-86
Io	dBm/95.04MHz	1	-64.41	-64.41	-Infinity	-64.41
		2	-64.41	-64.41	-Infinity	-64.41
Time multiplexing of the downlink transmissions from each AoA		1, 2	Defined in Figure 7.6.1.1.5-1			
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. Note 4: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation Note 5: Calculation of Es/Iot_BB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMB_P from TS 38.101-2 [19] Table 6.2.1.3-4.						

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_DCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.
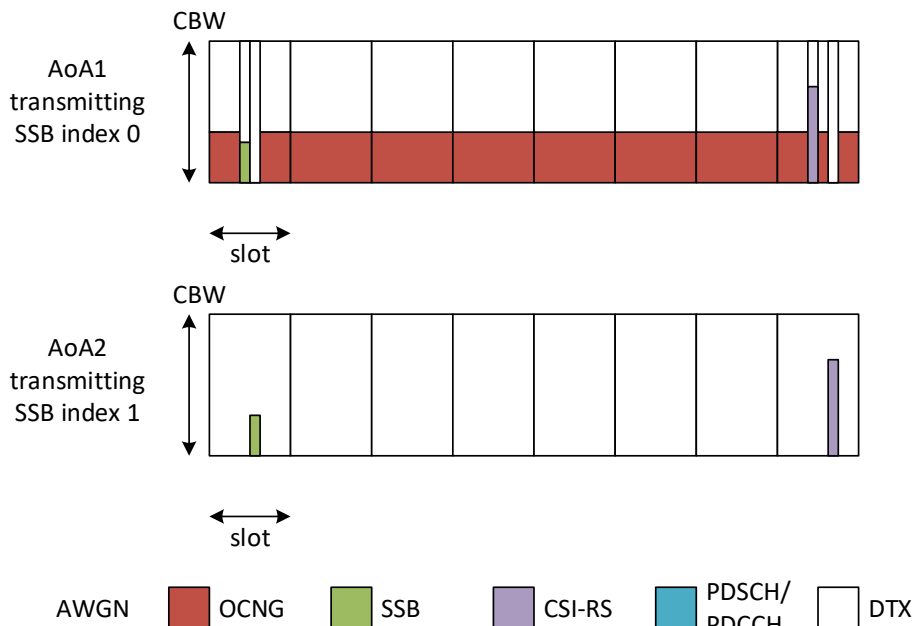
Figure 7.6.1.1.5-1: Time multiplexed downlink transmissions (Config 1 example)

7.6.1.2 NR SA FR2 event-triggered reporting without gap in DRX

Editor's Note: This test case is complete for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

7.6.1.2.1 Test purpose

Ther purpose of this test is to verify the UE's ability to make a correct reporting of an event within intra-frequency cell search without gap under DRX. This test will partly verify the TDD intra-frequency cell search requirements in TS 38.133 clause 9.2.5.1 and 9.2.5.2.

7.6.1.2.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting 5GS NR SA FR2 and long DRX cycle.

7.6.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.1.2.

7.6.1.2.4 Test description

7.6.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.1.2.4.1-1.

Table 7.6.1.2.4.1-1: Supported test configurations for NR SA FR2 event-triggered reporting without gap in DRX

Test Case ID	Description
7.6.1.2-1	120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
7.6.1.2-2	240 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 7.6.1.2.4.1-2.

Table 7.6.1.2.4.1-2: Initial conditions for NR SA FR2 event-triggered reporting without gap in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.6.1.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The test parameters for PCell and neighbour cell are given in Table 7.6.1.2.4.1-3 below.

2. Message contents are defined in clause 7.6.1.2.4.3.

3. There is one carrier and two cells specified in the test. NR Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.6.1.2.4.1-3: General test parameters for NR SA FR2 event-triggered reporting without gap in DRX

Parameter	Unit	Config	Value		Comment
			Test 1	Test 2	
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.
SMTC configuration		1, 2	SMTC.1		
A3-Offset	dB	1, 2	7$^{Note 1}$		
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. 7	
Time offset between Cell 1 and Cell 2		1, 2	3 μs		Synchronous cells
T1	s	1, 2	5		
T2	s	1, 2	10	52	
Note 1: Including test tolerance given in Annex F.1.3.2					

7.6.1.2.4.2 Test procedure

Two cells are deployed in the test, which are FR2 PCell (NR Cell 1) and a FR2 neighbour cell (NR Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 7.6.1.2.4.1-3, Table 7.6.1.2.5-1 and Table 7.6.1.2.5-2, respectively. In the measurement control information a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR Cell 2.

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

2. Set the parameters according to T1 in Table 7.6.1.2.5-1 and Table 7.6.1.2.5-2. T1 starts.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit an *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.1.2.5-1 and Table 7.6.1.2.5-2. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than X ms for sub-test 1 or less than Y ms for sub-test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one. Where X is

   - 7202 for UE supporting power class 1,

   - 4322 for UE supporting power class 2, 3 or 4.

   and Y is

   - 51202 for UE supporting power class 1,

   - 30722 for UE supporting power class 2, 3 or 4.

7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall transmit an *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set NR Cell 2 physical cell identity = ((current NR Cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. After the RRC connection release, the SS:
   - transmits in NR Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in State state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),
   or
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

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

11. Repeat step 1-10 for each sub-test in Table 7.6.1.2.4.1-1 as appropriate.

7.6.1.2.4.3   Message contents

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

Table 7.6.1.2.4.3-1: Common Exception messages for NR SA FR2 event-triggered reporting without gap in DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTRA-FREQ Table H.3.1-3 with Condition INTRA-FREQ MO, Synchronous cells and NOT SS-SINR Table H.3.1-4 with A3-offset = -6dB Table H.3.1-7 with Condition INTRA-FREQ Table H.3.7-1 with Condition DRX.1 for sub-test 1 Table H.3.7-1 with Condition DRX. 7 for sub-test 2 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1
Specific message contents exceptions for Test Configuration 7.6.1.2-1	Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.3 FR2
Specific message contents exceptions for Test Configuration 7.6.1.2-2	Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.4 FR2

7.6.1.2.5 Test requirement

Table 7.6.1.2.4.1-3, Table 7.6.1.2.5-1 and Table 7.6.1.2.5-2 define the primary level settings including test tolerances for NR event triggered reporting in synchronous cells when DRX is used test.

Table 7.6.1.2.5-1: NR Cell specific test parameters for NR SA FR2 event-triggered reporting without gap in DRX

Parameter	Unit	Config	Cell 1		Cell 2	
			T1	T2	T1	T2
TDD configuration		1, 2	TDDConf.3.1		TDDConf.3.1	
BW$_{channel}$	MHz	1, 2	100: N$_{RB,c}$ = 66		100: N$_{RB,c}$ = 66	
Data RBs allocated		1, 2	66		66	
Initial BWP configuration		1, 2	DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1	
Active DL BWP configuration		1, 2	DLBWP.1.1		DLBWP.1.1	
Active UL BWP configuration		1, 2	ULBWP.1.1		ULBWP.1.1	
RLM-RS		1, 2	SSB		SSB	
PDSCH RMC configuration		1	SR.3. 2 TDD		N/A	
		2	SR.3.3 TDD			
RMSI CORESET RMC configuration		1	CR.3.1 TDD		CR.3.1 TDD	
		2	CR.3.2 TDD		CR.3.2 TDD	
Dedicated CORESET RMC configuration		1	CCR.3.1 TDD		CCR.3.1 TDD	
		2	CCR.3.7 TDD		CCR.3.7 TDD	
TRS configuration		1, 2	TRS.2.1 TDD		N/A	
PDSCH/PDCCH TCI states		1, 2	TCI.state.2		N/A	
PDSCH/PDCCH subcarrier spacing	kHz	1, 2	120		120	
OCNG Patterns		1, 2	OP.1		OP.1	
SSB		1	SSB.3 FR2		SSB.3 FR2	
		2	SSB.4 FR2		SSB.4 FR2	
Propagation Condition		1, 2	AWGN			

Table 7.6.1.2.5-2: NR OTA Cell specific test parameters for NR SA FR2 event-triggered reporting without gap in DRX

Parameter	Unit	Config	Cell 1		Cell 2	
			T1	T2	T1	T2
AoA setup		1, 2	Setup 1 defined in A.9			
Beam assumption[Note 4]		1,2	Rough			
$\hat{E}_s/I_{ot}$ BB [Note 5]	dB	1, 2	3.51	-1.60	-Infinity	-1.60
N_{oc} [Note 2]	dBm/15 KHz	1, 2	-101.5 [Note 6]			
N_{oc} [Note 2]	dBm/SCS	1	-92.5			
		2	-89.5			
SSB_RPSS-RSRP	dBm/SCS	1	-88.47	-88.47	-Infinity	-88.47
		2	-85.47	-85.47	-Infinity	-85.47
$\hat{E}_s/N_{oc}$	dB	1, 2	4	4	-Infinity	4
Io	dBm/95.04MHz	1	-58.03	-55.68	-58.03	-55.68

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.
Note 4:	Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation.
Note 5:	Calculation of Es/Iot_BB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMB_P from TS 38.101-2 [19] Table 6.2.1.3-4.
Note 6:	Including test tolerance given in Annex F.1.3.2

In Test 1 when DRX cycle length = 40 ms, the overall delay measured is defined as the time from the beginning of time period T2 to the moment the UE send one Event A3 triggered measurement report on PUSCH.

In Test 2 when DRX cycle length = 640 ms, the overall delay measured is defined as the time from the beginning of time period T2 to the moment the UE starts to send preambles on the PRACH for Scheduling Request (SR) to obtain allocation to send the measurement report to NR Cell 2 on PUSCH.

For both tests:

The 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 overall delays measured is defined as the time from the beginning of time period T2 to the moment the UE send one Event A3 triggered measurement report to NR Cell 2.

The overall delays measured in the test may be up to 2xTTI$_{DCCH}$ higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delay measured when DRX cycle length is 40 ms (sub-test 1) is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = T$_{identify\_intra\_without\_index}$

T$_{identify\_intra\_without\_index}$ = (T$_{PSS/SSS\_sync\_intra}$ + T$_{SSB\_measurement\_period\_intra}$) ms

For UE supporting power class 1, T$_{PSS/SSS\_sync\_intra}$ = 3600 ms, T$_{SSB\_measurement\_period\_intra}$ = 3600 ms,

For UE supporting power class 2, 3 or 4, T$_{PSS/SSS\_sync\_intra}$ = 2160 ms, T$_{SSB\_measurement\_period\_intra}$ = 2160 ms

TTI insertion uncertainty = 2 ms

The overall delay measured when DRX cycle length is 40 ms shall be less than a total of X ms, where X is

- X = 7202 for UE supporting power class 1,

- X = 4322 for UE supporting power class 2, 3 or 4,

The overall delay measured when DRX cycle length is 640 ms (sub-test 2) is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify\_intra\_without\_index}$

$T_{identify\_intra\_without\_index} = (T_{PSS/SSS\_sync\_intra} + T_{SSB\_measurement\_period\_intra})$ ms

For UE supporting power class 1, $T_{PSS/SSS\_sync\_intra} = 25600$ ms, $T_{SSB\_measurement\_period\_intra} = 25600$ ms,

For UE supporting power class 2, 3 or 4, $T_{PSS/SSS\_sync\_intra} = 15360$ ms, $T_{SSB\_measurement\_period\_intra} = 15360$ ms

TTI insertion uncertainty = 2 ms

The overall delay measured when DRX cycle length is 640 ms shall be less than a total of X ms, where

- X = 51202 for UE supporting power class 1,

- X = 30722 for UE supporting power class 2, 3 or 4,

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

7.6.1.3 NR SA FR2 event-triggered reporting with gap in non-DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

This test case is incomplete for UE power classes other than PC3

This test case is incomplete for test frequencies > 40.8 GHz

7.6.1.3.1 Test purpose

The purpose of this test is to verify UE's ability to make a correct reporting of an event with gaps under non-DRX within intra-frequency cell search with gaps requirements. This test will partly verify the TDD intra-frequency cell search requirements in TS 38.133 clause 9.2.5.1 and 9.2.5.2.

7.6.1.3.2 Test applicability

This test applies to all types of NR UE release 15 onwards and supporting CSI-RS based RLM and BWP operation without bandwidth restriction.

7.6.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.1.3.

7.6.1.3.4 Test description

7.6.1.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.1.3.4.1-1.

Table 7.6.1.3.4.1-1: Supported test configurations for NR SA FR2 event-triggered reporting with gap in non-DRX

Test Case ID	Description
7.6.1.3-1	120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
7.6.1.3-2	240 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
Note:	The UE is only required to be tested in one of the supported test configurations.

Configure the test equipment and the DUT according to the parameters in Table 7.6.1.3.4.1-2.

Table 7.6.1.3.4.1-2: Initial conditions for NR SA FR2 event-triggered reporting with gap in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 6.6.1.3.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 7.6.1.3.4.1-3.

2. Message contents are defined in clause 7.6.1.3.4.3.

3. There is one NR carrier and two cells specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.6.1.3.4.1-3: General test parameters for NR SA FR2 event-triggered reporting with gap in non-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	-11	
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 cells
T1	s	1, 2	5	
T2	s	1, 2	5	

7.6.1.3.4.2 Test procedure

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table 7.6.1.3.4.1-3, Table 7.6.1.3.5-1 and Tavke 7.6.1.3.5-2, respectively. In the measurement control information a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

There are two BWPs configured in Cell 1, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 1. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

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

2. Set the parameters according to T1 in Table 7.6.1.3.5-1 and Table 7.6.1.3.5-2. T1 starts.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit an *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.1.3.5-1 and Table 7.6.1.3.5-2.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than X ms then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one. Where X is

   - X = 3202 for UE supporting power class 1,

   - X = 1922 ms for UE supporting power class 2, 3 or 4,

7. After the SS receive the MeasurementReport message in step 6) or when T2 expires, the SS shall transmit an *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. After the RRC connection release, the SS:
   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),
   or
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

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

7.6.1.3.4.3 Message contents

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

Table 7.6.1.3.4.3-1: Common Exception messages for NR SA FR1 event-triggered reporting with gap in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTRA-FREQ and GAP NEEDED Table H.3.1-4 with A3-offset = -11dB Table H.3.1-6 with Condition gapUE and Pattern #0 Table H.3.1-7 with Condition INTRA-FREQ

Table 7.6.1.3.4.3-2: MeasObjectNR (Step 3, test procedure)

Information Element	Value/remark	Comment	Condition
Derivation Path: Table H.3.1-3 with condition INTRA-FREQ MO, Synchronous cells and NOT SS-SINR			
MeasObjectNR::= SEQUENCE {			
ssbSubcarrierSpacing	SubcarrierSpacing specified in 38.508-1 [14] Table 7.3.1-3a with condition SSB.3 FR2		7.6.1.3-1,
	SubcarrierSpacing specified in 38.508-1 [14] Table 7.3.1-3a with condition SSB.4 FR2		7.6.1.3-2,
smtc1	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1		
cellsToAddModList SEQUENCE (SIZE (1..maxNrofCellMeas)) OF CellsToAddMod {	1 entry		
CellsToAddMod[1] SEQUENCE {		entry 1	
physCellId	PhysCellId of Cell 2		
cellIndividualOffset SEQUENCE {			
rsrpOffsetSSB	dB16		
rsrqOffsetSSB	Not present		
sinrOffsetSSB	Not present		
rsrpOffsetCSI-RS	Not present		
rsrqOffsetCSI-RS	Not present		
sinrOffsetCSI-RS	Not present		
}			
}			
}			
}			

Table 7.6.1.3.4.3-3: *ServingCellConfig*

Information Element	Value/remark	Comment	Condition
Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition BWP-Id1			
ServingCellConfig ::= SEQUENCE {			
downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE {			
BWP-Downlink[1]	BWP-Downlink with condition BWP-Id1	DLBWP.1.2 configuration	
}			
firstActiveDownlinkBWP-Id	1	Active DL BWP-ID (BWP2)	BWP-Id1
defaultDownlinkBWP-Id	0	Initial BWP (BWP1)	
uplinkConfig SEQUENCE {			
uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE {			
BWP-Uplink[1]	BWP-Uplink with condition BWP-Id1	ULBWP.1.2 configuration	
}			
firstActiveUplinkBWP-Id	1	Active UL BWP-ID (BWP2)	BWP-Id1
}			
}			

7.6.1.3.5 Test requirement

Table 7.6.1.3.4.1-3 and Table 7.6.1.3.5-1 define the primary level settings including test tolerances for NR SA FR1 event-triggered reporting with gap in non-DRX test.

Table 7.6.1.3.5-1: NR Cell specific test parameters for NR SA FR1 event-triggered reporting with gap in non-DRX

Parameter	Unit	Config	Cell 1		Cell 2	
			T1	T2	T1	T2
TDD configuration		1, 2	TDDConf.3.1		TDDConf.3.1	
BW$_{channel}$	MHz	1, 2	100: N$_{RB,c}$ = 66		100: N$_{RB,c}$ = 66	
Initial BWP configuration		1, 2	DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1	
Active DL BWP configuration		1, 2	DLBWP.1.2		DLBWP.1.1	
Active UL BWP configuration		1, 2	ULBWP.1.2		ULBWP.1.1	
RLM-RS		1, 2	CSI-RS		SSB	
PDSCH RMC configuration		1	SR.3.2 TDD		N/A	
		2	SR.3.3 TDD			
RMSI CORESET RMC configuration		1	CR.3.1 TDD		CR.3.1 TDD	
		2	CR.3.2 TDD		CR.3.2 TDD	
Dedicated CORESET RMC configuration		1	CCR.3.1 TDD		CCR.3.1 TDD	
		2	CCR.3.7 TDD		CCR.3.7 TDD	
TRS configuration		1, 2	TRS.2.1 TDD		N/A	
PDSCH/PDCCH TCI states		1, 2	TCI.State.2		N/A	
PDSCH/PDCCH subcarrier spacing	kHz	1, 2	120		120	
OCNG Patterns		1, 2	OP.1		OP.1	
cellIndividualOffset	dB	1,2	N/A		16	
SSB		1	SSB.3 FR2		SSB.3 FR2	
		2	SSB.4 FR2		SSB.4 FR2	
Propagation Condition		1, 2	AWGN			

Table 7.6.1.3.5-2: 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	Cell 1		Cell 2	
			T1	T2	T1	T2
AoA setup		1, 2	Setup 3 defined in A.9			
			AoA1		AoA2	
Beam Assumption[Note 4]		1,2	Rough		Rough	
E_s	dBm/SCS	1	-89		-89	
		2	-86		-86	
$\hat{E}_s/I_{ot}$ BB [Note 5]	dB	1, 2	-0.12	-0.12	-Infinity	-0.12
SSB_RP	dBm/SCS	1	-89	-89	-Infinity	-89
		2	-86	-86	-Infinity	86
Io	dBm/95.04MHz	1	-64.41	-64.41	-Infinity	-64.41
		2	-61.41	-61.41	-Infinity	-61.41
Time multiplexing of the downlink transmissions from each AoA		1,2	Defined in Figure 7.6.1.3.5-1			
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. Note 4: Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation Note 5: Calculation of Es/Iot$_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMB$_P$ from TS 38.101-2 [19] Table 6.2.1.3-4.						

The overall delays measured is defined as the time from the beginning of time period T2, to the moment the UE send one Event A3 triggered measurement report.

The overall delays measured in the test may be up to 2xTTI$_{DCCH}$ higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

The overall delays measured test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = T$_{identify\_intra\_without\_index}$

T$_{identify\_intra\_without\_index}$ = T$_{PSS/SSS\_sync\_intra}$ + T$_{SSB\_measurement\_period\_intra}$

For UE supporting power class 1, T$_{PSS/SSS\_sync\_intr}$ = 1600 ms, T $_{SSB\_measurement\_period\_intra}$= 1600 ms,

For UE supporting power class 2, 3 or 4, T$_{PSS/SSS\_sync\_intr}$ = 960 ms, T $_{SSB\_measurement\_period\_intra}$= 960 ms

TTI insertion uncertainty = 2 ms

The overall delays measured shall be less than a total of X ms in this test case (note: this gives a total of 800 ms for measurement reporting delay plus 2 ms for TTI insertion uncertainty), where

X = 3202 for UE supporting power class 1,

X = 1922 for UE supporting power class 2, 3 or 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.

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.
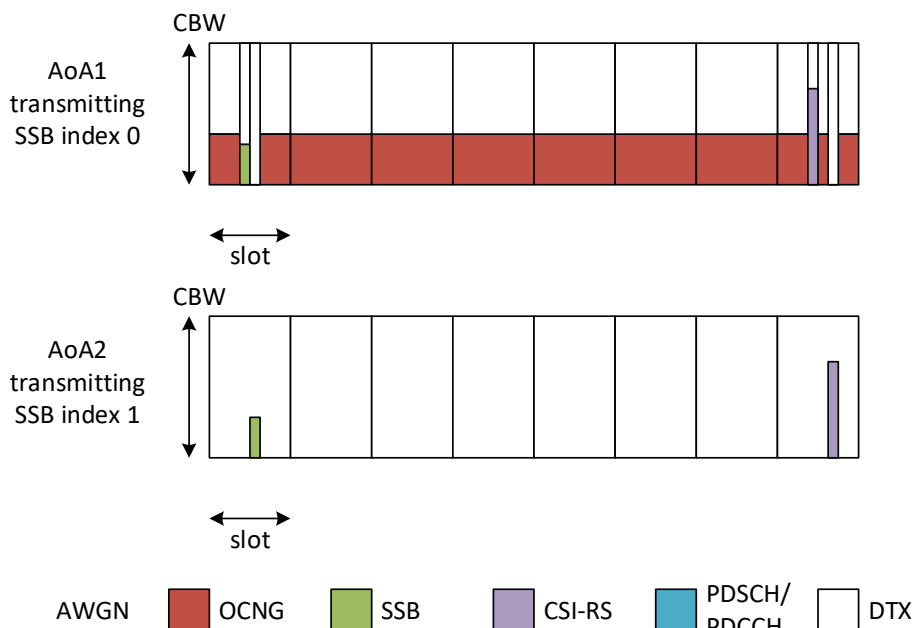
Figure 7.6.1.3.5-1: Time multiplexed downlink transmissions (Config 1 example)

7.6.1.4 NR SA FR2 event-triggered reporting with gap in DRX

Editor's Note: This test case is complete for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

This test case is incomplete for Test frequency f > 40.8 GHz

This test case is incomplete for UE power class other than PC3.

7.6.1.4.1 Test purpose

The purpose of this test is to verify UE's ability to make a correct reporting of an event with gaps under DRX within intra-frequency cell search with gaps requirements. This test will partly verify the TDD intra-frequency cell search requirements in TS 38.133 clause 9.2.5.1 and 9.2.5.2.

7.6.1.4.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting 5GS NR SA FR2, CSI-RS based RLM and long DRX cycle.

7.6.1.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.1.4.

7.6.1.4.4 Test description

7.6.1.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.1.4.4.1-1.

Table 7.6.1.4.4.1-1: Supported test configurations for NR SA FR2 event-triggered reporting with gap in DRX

Test Case ID	Description
7.6.1.4-1	120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
7.6.1.4-2	240 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
Note:	The UE is only required to be tested in one of the supported test configurations.

Configure the test equipment and the DUT according to the parameters in Table 7.6.1.4.4.1-2.

Table 7.6.1.4.4.1-2: Initial conditions for NR SA FR2 event-triggered reporting with gap in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.5-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 7.6.1.4.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 7.6.1.4.4.1-3.

2. Message contents are defined in clause 7.6.1.4.4.3.

3. There is one NR carrier and two cells specified in the test. Cell 1 is the cell used for connection setup with the power level set according to Annex C.1.1 and C.1.2 for this test.

Table 7.6.1.4.4.1-3: General test parameters for NR SA FR2 event-triggered reporting with gap in DRX

Parameter	Unit	Config	Value		Comment
			Test 1	Test 2	
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	-7[Note1]		
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. 7	
Time offset between Cell 1 and Cell 2		1, 2	3 µs		Synchronous cells
T1	s	1, 2	5		
T2	s	1, 2	10	52	
Note 1: Including test tolerance given in Annex F.1.3.2					

7.6.1.4.4.2 Test procedure

Two cells are deployed in the test, which are FR2 PCell (Cell 1) and a FR2 neighbour cell (Cell 2) on the same frequency as the PCell. The general and cell specific test parameters for PCell and neighbour cell are given in Table

7.6.1.4.4.1-3 and Table 7.6.1.4.4.2-1, respectively. In the measurement control information a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

There are two BWPs configured in Cell 1, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 1. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

In Test 1 when DRX cycle = 40 ms is used, UE needs to be provided at least once every 500 ms with new Timing Advance Command MAC control element to restart the Timer Alignment Timer to keep the UE uplink time alignment. Furthermore, the UE is allocated with PUSCH resource at every DRX cycle. In Test 2 when DRX = 640 ms is used, the uplink time alignment is not maintained and the UE needs to use RACH to obtain uplink allocation for measurement reporting.

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

2. Set the parameters according to T1 in Table 7.6.1.4.5-1 and Table 7.6.1.4.5-2. T1 starts.

3. SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit an *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.1.4.5-1 and Table 7.6.1.4.5-2.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than X ms for Test 1 or less than Y ms for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one. Where X and Y is

   - X = 7202, Y = 51202 for UE supporting power class 1,

   - X = 4322, Y = 30722 for UE supporting power class 2, 3 or 4,

7. After the SS receive the *MeasurementReport* message in step 6) or when T2 expires, the SS shall transmit an *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 14 + 2) for next iteration of the test procedure loop.

9. After the RRC connection release, the SS:
   - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5),
   or
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.

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

11. Repeat step 1-10 for each sub-test in Table 7.6.1.4.4.1-3 as appropriate.

7.6.1.4.4.3   Message contents

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

Table 7.6.1.4.4.3-1: Common Exception messages for NR SA FR2 event-triggered reporting with gap in DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTRA-FREQ and GAP NEEDED Table Table H.3.1-3 with Condition INTRA-FREQ MO, Synchronous cells and NOT SS-SINR Table H.3.1-4 with A3-offset = -6dB Table H.3.1-6 with Condition gapUE and Pattern #0 Table H.3.1-7 with Condition INTRA-FREQ Table H.3.7-1 with Condition DRX.1 and Gap for test 1 Table H.3.7-1 with Condition DRX. 7 and Gap for test 2 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Specific message contents exceptions for Test Configuration 7.6.1.4-1	Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.3 FR2
Specific message contents exceptions for Test Configuration 7.6.1.4-2	Table 7.3.1-3a in TS 38.508-1 [14] with condition SSB.4 FR2

Table 7.6.1.4.4.3-2: *ServingCellConfig*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition BWP-Id1			
Information Element	Value/remark	Comment	Condition
ServingCellConfig ::= SEQUENCE {			
downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE {			
BWP-Downlink[1]	BWP-Downlink with condition BWP-Id1	DLBWP.1.2 configuration	
}			
firstActiveDownlinkBWP-Id	1	Active DL BWP-ID (BWP2)	BWP-Id1
defaultDownlinkBWP-Id	0	Initial BWP (BWP1)	
uplinkConfig SEQUENCE {			
uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF SEQUENCE {			
BWP-Uplink[1]	BWP-Uplink with condition BWP-Id1	ULBWP.1.2 configuration	
}			
firstActiveUplinkBWP-Id	1	Active UL BWP-ID (BWP2)	BWP-Id1
}			
}			

Condition	Explanation
BWP-Id1	Active BWP (BWP2)

7.6.1.4.5 Test requirement

Table 7.6.1.4.4.1-3 , Table 7.6.1.4.5-1 and Table 7.6.1.4.5-2 define the primary level settings including test tolerances for NR SA FR1 event-triggered reporting with gap in DRX test.

Table 7.6.1.4.5-1: NR Cell specific test parameters for NR SA FR2 event-triggered reporting with gap in DRX

Parameter	Unit	Config	Cell 1		Cell 2	
			T1	T2	T1	T2
TDD configuration		1, 2	TDDConf.3.1		TDDConf.3.1	
BW$_{channel}$	MHz	1, 2	100: N$_{RB,c}$ = 66		100: N$_{RB,c}$ = 66	
Data RBs allocated		1, 2	66		66	
Initial BWP configuration		1, 2	DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1	
Active DL BWP configuration		1, 2	DLBWP.1.2		DLBWP.1.1	
Active UL BWP configuration		1, 2	ULBWP.1.2		ULBWP.1.1	
RLM-RS		1, 2	CSI-RS		SSB	
PDSCH RMC configuration		1	SR.3.2 TDD		N/A	
		2	SR.3.3 TDD			
RMSI CORESET RMC configuration		1	CR.3.1 TDD		CR.3.1 TDD	
		2	CR.3.2 TDD		CR.3.2 TDD	
Dedicated CORESET RMC configuration		1	CCR.3.1 TDD		CCR.3.1 TDD	
		2	CCR.3.7 TDD		CCR.3.7 TDD	
TRS configuration		1, 2	TRS.2.1 TDD		N/A	
PDSCH/PDCCH TCI state		1, 2	TCI.State.2		N/A	
OCNG Patterns		1, 2	OP.1		OP.1	
SSB		1	SSB.3 FR2		SSB.3 FR2	
		2	SSB.4 FR2		SSB.4 FR2	
Propagation Condition		1, 2	AWGN			

Table 7.6.1.4.5-2: NR OTA Cell specific test parameters for NR SA FR2 event-triggered reporting with gap in DRX

Parameter	Unit	Config	Cell 1		Cell 2	
			T1	T2	T1	T2
AoA setup		1, 2	Setup 1 defined in A.3.15.1			
Beam Assumption[Note 4]		1,2	Rough			
$\hat{E}_s/I_{ot}$ BB [Note 5]	dB	1, 2	3.51	-1.60	-Infinity	-1.60
N_{oc} [Note 2]	dBm/15 KHz	1, 2	-101.5[Note 6]			
N_{oc} [Note 2]	dBm/SCS	1	-92.5			
		2	-89.5			
SSB_RPSS-RSRP	dBm/SCS	1	-88.47	-88.47	-Infinity	-88.47
		2	-85.47	-85.47	-Infinity	-85.47
$\hat{E}_s/N_{oc}$	dB	1, 2	4	4	-Infinity	4
Io	dBm/95.04MHz	1	-58.03	-55.68	-58.03	-55.68

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.
Note 4:	Information about types of UE beam is given in TS 38.133 [6] clause B.2.1.3, and does not limit UE implementation or test system implementation
Note 5:	Calculation of Es/Iot$_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMB$_P$ from TS 38.101-2 [19] Table 6.2.1.3-4.
Note 6:	Including test tolerance given in Annex F.1.3.2

In Test 1 when DRX cycle length = 40 ms is used, the overall delay measured is defined as the time from the beginning of time period T2, to the moment the UE send one Event A3 triggered measurement report on PUSCH.

In Test 2 when DRX cycle length = 640 ms is used, the overall delay measured is defined as the time from the beginning of time period T2, to the moment the UE starts to send preambles on the PRACH for Scheduling Request (SR) to obtain allocation to send the measurement report on PUSCH.

For both tests:

The overall delays measured in the test may be up to 2xTTI$_{DCCH}$ higher than the measurement reporting delays because of TTI insertion uncertainty of the measurement report in DCCH.

NOTE 1: The actual overall delays measured in the test may be up to one DRX cycle higher than the measurement reporting delays above because UE is allowed to delay the initiation of the measurement reporting procedure to the next until the Active Time.

NOTE 2: In order to calculate the rate of correct events the system simulator shall verify that it has received correct Event A3 measurement report.

The overall delay measured when DRX cycle length is 40 ms test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify\_intra\_without\_index}$

$T_{identify\_intra\_without\_index} = (T_{PSS/SSS\_sync\_intra} + T_{SSB\_measurement\_period\_intra})$ ms

For UE supporting power class 1, $T_{PSS/SSS\_sync\_intra} = 7200ms$, $T_{SSB\_measurement\_period\_intra} = 7200$ ms,

For UE supporting power class 2, 3 or 4, $T_{PSS/SSS\_sync\_intra} = 2160$ ms, $T_{SSB\_measurement\_period\_intra} = 2160$ ms

TTI insertion uncertainty = 2 ms

The overall delay measured when DRX cycle length is 40 ms shall be less than a total of X ms, where X is

- X = 7202 for UE supporting power class 1,

- X = 4322 for UE supporting power class 2, 3 or 4,

The overall delay measured when DRX cycle length is 640 ms test requirement is expressed as:

Overall delays measured = measurement reporting delay + TTI insertion uncertainty

Measurement reporting delay = $T_{identify\_intra\_without\_index}$

$T_{identify\_intra\_without\_index} = (T_{PSS/SSS\_sync\_intra} + T_{SSB\_measurement\_period\_intra})$ ms

For UE supporting power class 1, $T_{PSS/SSS\_sync\_intra} = 25600$ ms, $T_{SSB\_measurement\_period\_intra} = 25600$ ms,

For UE supporting power class 2, 3 or 4, $T_{PSS/SSS\_sync\_intra} = 15360$ ms, $T_{SSB\_measurement\_period\_intra} = 15360$ ms

TTI insertion uncertainty = 2 ms

The overall delay measured when DRX cycle length is 640 ms shall be less than a total of X ms, where

- X = 51202 for UE supporting power class 1,

- X = 30722 for UE supporting power class 2, 3 or 4,

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

7.6.2 Inter-frequency measurements

7.6.2.0 Minimum conformance requirements for Inter-frequency measurements

Same as clause 5.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause 9.3.2, 9.3.4, 9.3.5, 9.3.6.3.

7.6.2.1 NR SA FR2-FR2 event-triggered reporting in non-DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

7.6.2.1.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

7.6.2.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.6.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.2.1.

7.6.2.1.4   Test description

7.6.2.1.4.1   Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.2.1.4.1-1.

Table 7.6.2.1.4.1-1: NR FR2-FR2 event triggered reporting tests in non-DRX supported test configurations

Test Case ID	Description
7.6.2.1-1	120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
Note 1: Void	

Table 7.6.2.1.4.1-1: General test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection

Parameter	Unit	Test configuration	Value	Comment
NR RF Channel Number		Config 1	1, 2	Two FR2 NR carrier frequencies is used.
Active cell		Config 1	NR cell 1 (Pcell)	NR Cell 1 is on NR RF channel number 1.
Neighbour cell		Config 1	NR cell 2	NR cell 2 is on NR RF channel number 2.
Gap Pattern Id		Config 1	13	As specified in clause 9.1.2-1.
Measurement gap offset		Config 1	39	
SMTC-SSB parameters		Config 1	SSB.3 FR2	As specified in clause A.3.10.2
offsetMO	dB	Config 1	16	Applied to NR Cell 2 measurement object
A3-Offset	dB	Config 1	-11	
Hysteresis	dB	Config 1	0	
CP length		Config 1	Normal	
TimeToTrigger	s	Config 1	0	
Filter coefficient		Config 1	0	L3 filtering is not used
DRX		Config 1	OFF	DRX is not used
Time offset between serving and neighbour cells		Config 1	3µs	Synchronous cells.
T1	s	Config 1	5	
T2	s	Config 1	5.2 for PC1; 3.5 for other PC	

Table 7.6.2.1.4-3: Test Environment parameters for SA inter-frequency event triggered reporting without SSB time index detection in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 7.6.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram			

1. Message contents are defined in clause 7.6.2.1.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

3. The AoA setup for this test is Setup 3 as defined in clause A.9 The UE RX spherical coverage direction has been obtained previously using one of the search procedures as described in Annex I.

7.6.2.1.4.2 Test procedure

In this test, there are two cells: NR cell 1 as PCell in FR2 on NR RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2.

In test 1 measurement gap pattern configuration # 0 as defined in Table 7.6.2.1.4.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table 7.6.2.1.4.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

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

2. Set the parameters according to T1 in Table 7.6.2.1.4.1-2. The TE shall ensure that the NR FR2 cells 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 [3] and relative angular offset between active probes are according to Table A.9.3-1. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.2.1.4.1-2. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 5122 ms for UE supporting power class 1, or 3202 ms for UE supporting other power class for Test 1 and Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = [(current cell 2 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. TE shall change the active probes in such way that relative angular offset between active probes differs in the following iteration.

10. After the RRC connection release, the SS:

    - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.), or:

    - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

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

12. Repeat step 1-11 for each sub-test in Table 7.6.2.1.4.1-2 as appropriate.

7.6.2.1.4.3 Message contents

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

Table 7.6.2.1.4.3-1: Common Exception messages SA inter frequency event triggered reporting without SSB time index detection in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Conditions GAP NEEDED and INTER-FREQ Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells Table H.3.1-4 with A3-offset = -11dB Table H.3.1-5 Table H.3.1-6 with Conditions gapUE and Pattern #13 Table H.3.1-7 with Condition INTER-FREQ

Table 7.6.2.1.4.3-2: MeasObjectNR-DEFAULT: SA FR2-FR2 measurement object configuration

Derivation Path: Table H.3.1-3			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectNR::= SEQUENCE {			
offsetMO SEQUENCE {			
rsrpOffsetSSB	dB16		
}			

7.6.2.1.5 Test requirement

Table 7.6.2.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.2.1.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection

Parameter		Unit	Test configuration	Cell 1		Cell 2	
				T1	**T2**	**T1**	**T2**
AoA setup			Config 1	Setup 3 as specified in clause A.9			
				AoA1		AoA2	
Assumption for UE beams[Note 7]			Config 1,2	Rough		Rough	
NR RF Channel Number			Config 1	1		2	
Duplex mode			Config 1	TDD		TDD	
TDD configuration			Config 1	TDDConf.3.1		TDDConf.3.1	
$BW_{channel}$		MHz	Config 1	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
Data RBs allocated			Config 1	66		66	
BWP BW		MHz	Config 1	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
BWP configuration	Initial DL BWP			DLBWP.0.1		N/A	
	Initial UL BWP			ULBWP.0.1		N/A	
	Dedicated DL BWP		Config 1	DLBWP.1.1		N/A	
	Dedicated UL BWP			ULBWP.1.1		N/A	

OCNG Patterns		Config 1	OP.1		OP.1	
PDSCH Reference measurement channel		Config 1	SR.3.1 TDD		-	
CORESET Reference Channel		Config 1	CR.3.1 TDD		-	
SMTC configuration		Config 1	SMTC.1		SMTC.1	
PDSCH/PDCCH subcarrier spacing	kHz	Config 1	120		120	
TRS configuration		Config 1	TRS.2.1 TDD		N/A	
PDSCH/PDCCH TCI state		Config 1	TCI.State.2		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		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)						
$\hat{E}_s$	dBm/SCS	Config 1	-87	-87	-Infinity	-87
SSB-RP [Note 3]	dBm/SCS Note5	Config 1	-87	-87	-Infinity	-87
$\hat{E}_s / I_{ot\ BB}$ [Note 8]	dB	Config 1	1.89	1.89	-Infinity	1.89
Io [Note3]	dBm/95.04 MHz Note5	Config 1	-58.01	-58.01	-Infinity	-58.01
Propagation Condition		Config 1	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:	Void					
Note 3:	SSB-RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.					
Note 4:	Void					
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					
Note 7:	Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3, and does not limit UE implementation or test system implementation					
Note 8:	Calculation of Es/Iot$_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1dB for UE multi-band relaxation factor ΔMB_S from TS 38.101-2 [3] Table 6.2.1.3-4.					

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.

The 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% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2 \times \text{TTI}_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 5122 ms in this test for power class UE and 3202 ms for other power classes.

7.6.2.2 NR SA FR2-FR2 event-triggered reporting in DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

7.6.2.2.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

7.6.2.2.2 Test applicability

This test applies to all types of NR UE Release 15 and forward supporting 5GS NR SA FR2 and long DRX cycle.

7.6.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.2.2.

7.6.2.2.4 Test description

7.6.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.2.2.4.1-1.

Table 7.6.2.2.4.1-1: NR FR2-FR2 event triggered reporting tests in DRX supported test configurations

Test Case ID	Description
7.6.2.2-1	120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
Note 1: Void	

Table 7.6.2.2.4.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection in DRX

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
NR RF Channel Number		Config 1	1, 2		Two FR1 NR carrier frequencies is used.
Active cell		Config 1	NR cell 1 (Pcell)		NR Cell 1 is on NR RF channel number 1.
Neighbour cell		Config 1	NR cell 2		NR cell 2 is on NR RF channel number 2.
Gap Pattern Id		Config 1	13		As specified in clause 9.1.2-1.
Measurement gap offset		Config 1	39		
SMTC-SSB parameters		Config 1	SSB.3 FR2		As specified in clause A.3.10.2
A3-Offset	dB	Config 1	-12		Value modified by TT
Hysteresis	dB	Config 1	0		
CP length		Config 1	Normal		
TimeToTrigger	s	Config 1	0		
Filter coefficient		Config 1	0		L3 filtering is not used
DRX		Config 1	DRX.1	DRX.2	As specified in clause A.3.3
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 other PC	82 for PC1; 52 for other PC	

Table 7.6.2.2.4-3: Test Environment parameters for SA inter-frequency event triggered reporting without SSB time index detection in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 7.6.2.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram			

1. Message contents are defined in clause 7.6.2.2.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

3. The UE Rx beam peak direction for Cell 2 has been obtained previously using one of the Rx beam peak search procedures as described in Annex I.

7.6.2.2.4.2 Test procedure

In this test, there are two cells: NR cell 1 as PCell in FR2 on NR RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table 7.6.2.2.4.1-2 is provided for UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table 7.6.2.2.4.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

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

2. Set the parameters according to T1 in Table 7.6.2.2.4.1-2. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.2.2.4.1-2.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 7682 ms for UE supporting power class 1, or 4802 ms for UE supporting other power class for Test 1 and Test 3 and 81922 ms for UE supporting power class 1, or 51202 ms for UE supporting other power class for Test 2 and Test 4 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = [(current cell 2 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

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

11. Repeat step 1-10 for each sub-test in Table 7.6.2.2.4.1-2 as appropriate.

7.6.2.2.4.3 Message contents

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

Table 7.6.2.2.4.3-1: Common Exception messages SA inter frequency event triggered reporting without SSB time index detection in DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Conditions GAP NEEDED and INTER-FREQ Table H.3.1-3 with Conditions INTER-FREQ MO and and Synchronous cells Table H.3.1-4 with A3-offset = -12dB Table H.3.1-5 Table H.3.1-6 with Conditions gapUE and Pattern #13 Table H.3.1-7 with Condition INTER-FREQ Table H.3.7-1 with Condition DRX.1 for Test 1 and DRX.2 for Test 2

7.6.2.2.5   Test requirement

Table 7.6.2.2.5-1 defines the primary level settings including test tolerances for all tests.

Table A.7.6.2.2.1-3: Cell specific test parameters for CA inter-frequency event triggered reporting without SSB time index detection

Parameter		Unit	Test configuration	Cell 1		Cell 2	
				T1	T2	T1	T2
AoA setup			Config 1	Setup 1 as specified in clause A.9			
Beam Assumption[Note 7]			Config 1	Rough			
NR RF Channel Number			Config 1	1		2	
TDD configuration			Config 1	TDDConf.3.1		TDDConf.3.1	
Duplex mode			Config 1	TDD		TDD	
BW$_{channel}$		MHz	Config 1	100: N$_{RB,c}$ = 66		100: N$_{RB,c}$ = 66	
Data RBs allocated			Config 1	66		66	
BWP BW		MHz	Config 1	100: N$_{RB,c}$ = 66		100: N$_{RB,c}$ = 66	
BWP configuration	Initial DL BWP		Config 1	DLBWP.0.1		N/A	
	Dedicated DL BWP			DLBWP.1.1		N/A	
	Dedicated UL BWP			ULBWP.1.1		N/A	
OCNG Patterns			Config 1	OP.1		OP.1	
PDSCH Reference measurement channel			Config 1	SR.3.1 TDD		-	
CORESET Reference Channel			Config 1	CR.3.1 TDD		-	
SMTC configuration			Config 1	SMTC.1		SMTC.1	
PDSCH/PDCCH subcarrier spacing		kHz	Config 1	120		120	
EPRE ratio of PSS to SSS			Config 1	0		0	
EPRE ratio of PBCH DMRS to SSS							
EPRE ratio of PBCH to PBCH DMRS							
EPRE ratio of PDCCH DMRS to SSS							
EPRE ratio of PDCCH to PDCCH DMRS							
EPRE ratio of PDSCH DMRS to SSS							
EPRE ratio of PDSCH to PDSCH							
EPRE ratio of OCNG DMRS to SSS(Note 1)							
EPRE ratio of OCNG to OCNG DMRS (Note 1)							
N_{oc} [Note2]		dBm/15 kHz Note5		-104.7		-104.7	
N_{oc} [Note2]		dBm/SCS Note4	Config 1	-95.7		-95.7	
SSB_RP [Note 3]		dBm/SCS 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[Note3]		dBm/95.04 MHz Note5	Config 1	-59.7	-59.7	-66.7	-57.2
Propagation Condition			Config 1	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:	SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.	
Note 4:	Void	
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	
Note 7:	Information about types of UE beam is given in TS 38.133 Annex B.2.1.3, and does not limit UE implementation or test system implementation	

In test 1 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 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 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% with a confidence level of 95%.

  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.

  TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

  The overall delays measured shall be less than a total of 7682 ms for power class 1 UE and 4802 ms for other power classes in test 1 and 81922 for power class 1 UE and 51202 ms for other power classes in test 2.

7.6.2.3 NR SA FR2-FR2 event-triggered reporting in non-DRX with SSB time index detection

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

7.6.2.3.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

7.6.2.3.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.6.2.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.2.3.

7.6.2.3.4 Test description

7.6.2.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.2.3.4.1-1.

Table 7.6.2.3.4.1-1: NR FR2-FR2 event triggered reporting tests in non-DRX with SSB time index detection supported test configurations

Test Case ID	Description
7.6.2.3-1	120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
Note 1: Void	

Table 7.6.2.3.4.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection

Parameter	Unit	Test configuration	Value	Comment
NR RF Channel Number		Config 1	1, 2	Two FR2 NR carrier frequencies is used.
Active cell		Config 1	NR cell 1 (Pcell)	NR Cell 1 is on NR RF channel number 1.
Neighbour cell		Config 1	NR cell 2	NR cell 2 is on NR RF channel number 2.
Gap Pattern Id		Config 1	13	As specified in clause 9.1.2-1.
Measurement gap offset		Config 1	39	
SMTC-SSB parameters		Config 1	SSB.3 FR2	As specified in clause A.3.10.2
offsetMO	dB	Config 1	16	Applied to NR Cell 2 measurement object
A3-Offset	dB	Config 1	-11	
Hysteresis	dB	Config 1	0	
CP length		Config 1	Normal	
TimeToTrigger	s	Config 1	0	
Filter coefficient		Config 1	0	L3 filtering is not used
DRX		Config 1	OFF	DRX is not used
Time offset between serving and neighbour cells		Config 1	3μs	Synchronous cells.
T1	s	Config 1	5	
T2	s	Config 1	7 for PC1; 4.5 for other PC	

Table 7.6.2.3.4-3: Test Environment parameters for SA inter-frequency event triggered reporting with SSB time index detection in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 7.6.2.3.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram			

1. Message contents are defined in clause 7.6.2.3.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

3. The AoA setup for this test is Setup 3 as defined in clause A.9. The UE RX spherical coverage direction has been obtained previously using one of the search procedures as described in Annex I.

7.6.2.3.4.2 Test procedure

In this test, there are two cells: NR cell 1 as PCell in FR2 on NR RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2.

In test 1 measurement gap pattern configuration # 0 as defined in Table 7.6.2.3.4.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table 7.6.2.3.4.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

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

2. Set the parameters according to T1 in Table 7.6.2.3.4.1-2. The TE shall ensure that the NR FR2 cells 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 [3] and relative angular offset between active probes are according to Table A.9.3-1. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.2.3.4.1-2. T2 starts.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 6722 ms for UE supporting power class 1, or 4162 ms for UE supporting other power class for Test 1 and Test 2, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = [(current cell 2 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. TE shall change the active probes in such way that relative angular offset between active probes differs in the following iteration.10. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

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

12. Repeat step 1-11 for each sub-test in Table 7.6.2.3.4.1-2 as appropriate.

7.6.2.3.4.3 Message contents

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

Table 7.6.2.3.4.3-1: Common Exception messages SA inter frequency event triggered reporting with SSB time index detection in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Conditions GAP NEEDED and INTER-FREQ Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells Table H.3.1-4 with Condition SSB Index and A3-offset = -11dB Table H.3.1-5 Table H.3.1-6 with Conditions gapUE and Pattern #13 Table H.3.1-7 with Condition INTER-FREQ

Table 7.6.2.3.4.3-2: MeasObjectNR-DEFAULT: SA FR2-FR2 measurement object configuration

Derivation Path: Table H.3.1-3			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectNR::= SEQUENCE {			
offsetMO SEQUENCE {			
rsrpOffsetSSB	dB16		
}			

7.6.2.3.5 Test requirement

Table 7.6.2.3.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.2.3.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection

Parameter		Unit	Test configuration	Cell 1		Cell 2	
				T1	**T2**	**T1**	**T2**
AoA setup			Config 1	Setup 3 as specified in clause A.9			
				AoA1		AoA2	
Beam Assumption Note 7			Config 1	Rough		Rough	
NR RF Channel Number			Config 1	1		2	
Duplex mode			Config 1	TDD		TDD	
TDD configuration			Config 1	TDDConf.3.1		TDDConf.3.1	
BW$_{channel}$		MHz	Config 1	100: N$_{RB,c}$ = 66		100: N$_{RB,c}$ = 66	
Data RBs allocated			Config 1	66		66	
BWP BW		MHz	Config 1	100: N$_{RB,c}$ = 66		100: N$_{RB,c}$ = 66	
BWP configuration	Initial DL BWP		Config 1	DLBWP.0.1		N/A	
	Initial UL BWP			ULBWP.0.1		N/A	
	Dedicated DL BWP			DLBWP.1.1		N/A	
	Dedicated UL BWP			ULBWP.1.1		N/A	

Parameter	Unit					
OCNG Patterns		Config 1	OP.1		OP.1	
PDSCH Reference measurement channel		Config 1	SR.3.1 TDD		-	
CORESET Reference Channel		Config 1	CR.3.1 TDD		-	
SMTC configuration		Config 1	SMTC.1		SMTC.1	
PDSCH/PDCCH subcarrier spacing	kHz	Config 1	120		120	
TRS configuration		Config 1	TRS.2.1 TDD		N/A	
PDSCH/PDCCH TCI state		Config 1	TCI.State.2		N/A	
EPRE ratio of PSS to SSS		Config 1	0		0	
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
$\hat{E}_s$	dBm/SCS	Config 1	-87	-87	-Infinity	-87
SSB-RP Note 3	dBm/SCS Note5	Config 1	-87	-87	-Infinity	-87
$\hat{E}_s/I_{ot\,BB}$ Note 8	dB	Config 1	1.89	1.89	-Infinity	1.89
Io Note3	dBm/95.04 MHz Note5	Config 1	-58.01	-58.01	-Infinity	-58.01
Propagation Condition		Config 1	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: Void
Note 3: SSB-RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Void
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
Note 7: Information about types of UE beam is given in TS 38.133 [6] Annex B.2.1.3, and does not limit UE implementation or test system implementation
Note 8: Calculation of Es/Iot$_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1dB for UE multi-band relaxation factor ΔMB$_S$ from TS 38.101-2 [3] Table 6.2.1.3-4.

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.

The 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% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2 \times \text{TTI}_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 6722 ms in this test for power class UE and 4162 ms for other power classes.

7.6.2.4 NR SA FR2-FR2 event-triggered reporting in DRX with SSB time index detection

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

7.6.2.4.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

7.6.2.4.2 Test applicability

This test applies to all types of NR UE Release 15 and forward supporting 5GS NR SA FR2 and long DRX cycle.

7.6.2.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.2.4.

7.6.2.4.4 Test description

7.6.2.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.2.4.4.1-1.

Table 7.6.2.4.4.1-1: NR FR2-FR2 event triggered reporting tests in DRX with SSB time index detection supported test configurations

Test Case ID	Description
7.6.2.4-1	120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
Note 1: Void	

Table 7.6.2.4.4.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection in DRX

Parameter	Unit	Test configuration	Value		Comment
			Test 1	Test 2	
NR RF Channel Number		Config 1	1, 2		Two FR1 NR carrier frequencies is used.
Active cell		Config 1	NR cell 1 (Pcell)		NR Cell 1 is on NR RF channel number 1.
Neighbour cell		Config 1	NR cell 2		NR cell 2 is on NR RF channel number 2.
Gap Pattern Id		Config 1	13		As specified in clause 9.1.2-1.
Measurement gap offset		Config 1	39		
SMTC-SSB parameters		Config 1	SSB.3 FR2		As specified in clause A.3.10.2
A3-Offset	dB	Config 1	-12		Value modified by TT
Hysteresis	dB	Config 1	0		
CP length		Config 1	Normal		
TimeToTrigger	s	Config 1	0		
Filter coefficient		Config 1	0		L3 filtering is not used
DRX		Config 1	DRX.1	DRX.2	As specified in clause A.3.3
Time offset between serving and neighbour cells		Config 1	3μs		Synchronous cells.
T1	s	Config 1	5		
T2	s	Config 1	11 for PC1; 6.5 for other PC	108 for PC1; 67 for other PC	

Table 7.6.2.4.4-3: Test Environment parameters for SA inter-frequency event triggered reporting with SSB time index detection in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 7.6.2.4.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram			

1. Message contents are defined in clause 7.6.2.4.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

3. The UE Rx beam peak direction for Cell 2 has been obtained previously using one of the Rx beam peak search procedures as described in Annex I.

7.6.2.4.4.2   Test procedure

In this test, there are two cells: NR cell 1 as PCell in FR2 on NR RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table 7.6.2.4.4.1-2 is provided for UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table 7.6.2.4.4.1-2 is provided for UE that supports per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

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

2. Set the parameters according to T1 in Table 7.6.2.4.4.1-2. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.2.4.4.1-2.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 10082 ms for UE supporting power class 1, or 6242 ms for UE supporting other power class for Test 1 and Test 3 and 107522 ms for UE supporting power class 1, or 66562 ms for UE supporting other power class for Test 2 and Test 4, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = [(current cell 2 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

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

11. Repeat step 1-10 for each sub-test in Table 7.6.2.4.4.1-2 as appropriate.

7.6.2.4.4.3   Message contents

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

Table 7.6.2.4.4.3-1: Common Exception messages SA inter frequency event triggered reporting with SSB time index detection in DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Conditions GAP NEEDED and INTER-FREQ Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells Table H.3.1-4 with Condition SSB Index and A3-offset = -12dB Table H.3.1-5 Table H.3.1-6 with Conditions gapUE and Pattern #13 Table H.3.1-7 with Condition INTER-FREQ Table H.3.7-1 with Condition DRX.1 for Test 1 and DRX.2 for Test 2

7.6.2.4.5   Test requirement

Table 7.6.2.4.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.2.4.5-1: Cell specific test parameters for CA inter-frequency event triggered reporting with SSB time index detection

Parameter		Unit	Test configuration	Cell 1		Cell 2	
				T1	T2	T1	T2
AoA setup			Config 1	Setup 1 as specified in clause A.9			
Beam Assumption[Note 7]			Config 1	Rough			
NR RF Channel Number			Config 1	1		2	
Duplex mode			Config 1	TDD		TDD	
TDD configuration			Config 1	TDDConf.3.1		TDDConf.3.1	
BW$_{channel}$		MHz	Config 1	100: N$_{RB,c}$ = 66		100: N$_{RB,c}$ = 66	
Data RBs allocated			Config 1	66		66	
BWP BW		MHz	Config 1	100: N$_{RB,c}$ = 66		100: N$_{RB,c}$ = 66	
BWP configuration	Initial DL BWP		Config 1	DLBWP.0.1		N/A	
	Dedicated DL BWP			DLBWP.1.1		N/A	
	Dedicated UL BWP			ULBWP.1.1		N/A	
OCNG Patterns			Config 1	OP.1		OP.1	
PDSCH Reference measurement channel			Config 1	SR.3.1 TDD		-	
CORESET Reference Channel			Config 1	CR.3.1 TDD		-	
SMTC configuration			Config 1	SMTC.1		SMTC.1	
PDSCH/PDCCH subcarrier spacing		kHz	Config 1	120		120	
EPRE ratio of PSS to SSS			Config 1	0		0	
EPRE ratio of PBCH DMRS to SSS							
EPRE ratio of PBCH to PBCH DMRS							
EPRE ratio of PDCCH DMRS to SSS							
EPRE ratio of PDCCH to PDCCH DMRS							
EPRE ratio of PDSCH DMRS to SSS							
EPRE ratio of PDSCH to PDSCH							
EPRE ratio of OCNG DMRS to SSS(Note 1)							
EPRE ratio of OCNG to OCNG DMRS (Note 1)							
N_{oc} [Note2]		dBm/15 kHz Note5		-104.7		-104.7	
N_{oc} [Note2]		dBm/SCS Note4	Config 1	-95.7		-95.7	
SSB_RP [Note 3]		dBm/SCS 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[Note3]		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:	SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.	
Note 4:	Void	
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	
Note 7:	Information about types of UE beam is given in TS 38.133 Annex B.2.1.3, and does not limit UE implementation or test system implementation	

In test 1 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 , 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 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% with a confidence level of 95%.

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 10082 ms for power class 1 UE and 6242 ms for other power classes in test 1 and 107522 for power class 1 UE and 66562 ms for other power classes in test 2.

7.6.2.5 NR SA FR1-FR2 event-triggered reporting in non-DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

7.6.2.5.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

7.6.2.5.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.6.2.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.2.5.

7.6.2.5.4 Test description

7.6.2.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.2.5.4-1.

Table 7.6.2.5.4.1-1: SA FR1-FR2 event triggered reporting tests in non-DRX supported test configurations

Test Case ID	Description of serving cell	Description of target cell
7.6.2.5-1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
7.6.2.5-2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	
7.6.2.5-3	NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	
Note 1: The UE is only required to be tested in one of the supported test configurations		
Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell		

Table 7.6.2.5.4.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection

Parameter	Unit	Test configuration	Value Test 1	Value Test 2	Comment
NR RF Channel Number		Config 1,2,3	1, 2		One NR FR1 and one NR FR2 carrier frequency is used.
Active cell		Config 1,2,3	NR cell 1 (Pcell)		NR Cell 1 is on NR RF channel number 1 in FR1
Neighbour cell		Config 1,2,3	NR cell 2		NR cell 2 is on NR RF channel number 2 in FR2.
Gap Pattern Id		Config 1,2,3	0	Gap not configured	As specified in TS 38.133 [6]clause 9.1.2-1.
Measurement gap offset		Config 1,2,3	39	N/A	
SMTC-SSB parameters on NR RF Channel 1		Config 1	SSB.1 FR1		As specified in clause A.3.1
		Config 2	SSB.1 FR1		As specified in clause A.3.1
		Config 3	SSB.2 FR1		As specified in clause A.3.1
SMTC-SSB parameters on NR RF Channel 2		Config 1,2,3	SSB.3 FR2		As specified in clause A.3.2
offsetMO	dB	Config 1,2,3	6		
Hysteresis	dB	Config 1,2,3	0		
a4-Threshold	dBm	Config 1,2,3	-105		
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	5.2 for PC1; 3.5 for other PC	3 for PC1; 2 for other PC	PC1 - power class 1 as specified in TS 38.101-2 [3] Table 6.2.1.0

Table 7.6.2.5.4-3: Test Environment parameters for SA inter-frequency event triggered reporting with SSB time index detection in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 7.6.2.5.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram			

1. Message contents are defined in clause 7.6.2.5.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

3. If a UE supports per-FR gap it is only required to pass test 2. Otherwise it is only required to pass test 1.

4. The UE Rx beam peak direction for Cell 2 has been obtained previously using one of the Rx beam peak search procedures as described in Annex I.

7.6.2.5.4.2 Test procedure

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 2 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2.

In test 1 measurement gap pattern configuration # 0 as defined in Table 7.6.2.5.4.1-2 is provided for a UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table 7.6.2.5.4.1-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

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

2. Set the parameters according to T1 in Table 7.6.2.5.4.1-2. The TE shall ensure that the NR FR2 cell will be received by the UE from the Rx beam peak direction. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.2.5.4.1-2.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 5122 ms for UE supporting power class 1, or 3202 ms for UE supporting other power class for Test 1 and 2562 ms for UE supporting power class 1, or 1602 ms for UE supporting other power class for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = [(current cell 2 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

- transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
or:
- switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

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

11. Repeat step 1-10 for each sub-test in Table 7.6.2.5.4.1-2 as appropriate.

7.6.2.5.4.3 Message contents

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

Table 7.6.2.5.4.3-1: Common Exception messages SA inter frequency event triggered reporting without SSB time index detection in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Conditions GAP NEEDED and INTER-FREQ for Test 1 Table H.3.1-2 with Condition INTER-FREQ for Test 2 Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells Table H.3.1-4AA with A4-threshold= -105dB Table H.3.1-5 Table H.3.1-6 with Conditions gapUE and Pattern #0 for Test 1 Table H.3.1-7 with Condition INTER-FREQ

Table 7.6.2.5.4.3-2: MeasObjectNR-DEFAULT: SA FR1-FR2 measurement object configuration

Derivation Path: Table H.3.1-3			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectNR::= SEQUENCE {			
offsetMO SEQUENCE {			
rsrpOffsetSSB	dB6		
}			

7.6.2.5.5 Test requirement

Table 7.6.2.5.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.2.5.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection

Parameter		Unit	Test configuration	Cell 1		Cell 2	
				T1	**T2**	**T1**	**T2**
AoA setup			Config 1,2,3	N/A		Setup 1 as specified in clause A.9	
Beam Assumption[Note 7]			Config 1,2,3	N/A		Rough	
NR RF Channel Number			Config 1,2,3	1		2	
Duplex mode			Config 1	FDD		TDD	
			Config 2,3	TDD		TDD	
TDD configuration			Config 1	Not Applicable		TDDConf.3.1	
			Config 2	TDDConf.1.1		TDDConf.3.1	
			Config 3	TDDConf.2.1		TDDConf.3.1	
$BW_{channel}$		MHz	Config 1	10: $N_{RB,c} = 52$		100: $N_{RB,c} = 66$	
			Config 2	10: $N_{RB,c} = 52$		100: $N_{RB,c} = 66$	
			Config 3	40: $N_{RB,c} = 106$		100: $N_{RB,c} = 66$	
BWP BW		MHz	Config 1	10: $N_{RB,c} = 52$		100: $N_{RB,c} = 66$	
			Config 2	10: $N_{RB,c} = 52$		100: $N_{RB,c} = 66$	
			Config 3	40: $N_{RB,c} = 106$		100: $N_{RB,c} = 66$	
BWP configuration	Initial DL BWP		Config 1,2,3	DLBWP.0.1		N/A	
	Initial UL BWP			ULBWP.0.1		N/A	
	Dedicated DL BWP			DLBWP.1.1		N/A	
	Dedicated UL BWP			ULBWP.1.1		N/A	
OCNG Patterns			Config 1,2,3	OP.1		OP.1	
PDSCH Reference measurement channel			Config 1	SR.1.1 FDD		-	
			Config 2	SR.1.1 TDD			
			Config 3	SR.2.1 TDD			
RMSI CORESET Reference Channel			Config 1	CR.1.1 FDD		-	
			Config 2	CR.1.1 TDD			
			Config 3	CR.2.1 TDD			
Dedicated CORESET RMC configuration			Config 1	CCR.1.1 FDD		CCR.3.1 TDD	
			Config 2	CCR.1.1 TDD		CCR.3.1 TDD	
			Config 3	CCR.2.1 TDD		CCR.3.1 TDD	

				SMTC.2	SMTC.2
SMTC configuration		Config 1			
		Config 2,3		SMTC.1	SMTC.1
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2		15	120
		Config 3		30	120
EPRE ratio of PSS to SSS					
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		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)					
$\hat{E}_s$	dBm/SCS	Config 1,2,3		-Infinity	-87
SSB_RP $^{Note\ 3}$	dBm/SCS Note5	Config 1,2		-Infinity	-87
		Config 3		-Infinity	-87
$\hat{E}_s/I_{ot\ BB}$ $^{Note\ 8}$	dB	Config 1,2,3	NA Link only, see clause A.3.7A	-Infinity	14.69
	dBm/95.04 MHz Note5	Config 1,2,3		-Infinity	-58.01
Propagation Condition		Config 1,2,3		AWGN	

Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2: Void
Note 3: SSB_RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: Void
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
Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation
Note 8: Calculation of Es/Iot$_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMB$_S$ from TS 38.101-2 [19] Table 6.2.1.3-4.

In test 1 with per-UE 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 2, without the 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

2560 for UE supporting power class 1, or

1600 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% with a confidence level of 95%.

NOTE: The actual overall delays measured in the test may be up to $2 \times TTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 5122 ms for power class 1 UE and 3202 ms for other power classes in test 1 and 2562 for power class 1 UE and 1602 ms for other power classes in test 2.

7.6.2.6   NR SA FR1-FR2 event-triggered reporting in DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

7.6.2.6.1   Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

7.6.2.6.2   Test applicability

This test applies to all types of NR UE Release 15 and forward supporting 5GS NR SA FR2 and long DRX cycle.

7.6.2.6.3   Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.2.6.

7.6.2.6.4   Test description

7.6.2.6.4.1   Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.2.6.4.1-1.

Table 7.6.2.6.4.1-1: SA FR1-FR2 event triggered reporting tests in DRX supported test configurations

Test Case ID	Description of serving cell	Description of target cell
7.6.2.6-1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
7.6.2.6-2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	
7.6.2.6-3	NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	
Note 1: The UE is only required to be tested in one of the supported test configurations Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell		

Table 7.6.2.6.4.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection in DRX

Parameter	Unit	Test configuration	Value				Comment
			Test 1	Test 2	Test 3	Test 4	
NR RF Channel Number		Config 1,2,3	1, 2				Two NR carrier frequencies is used.
Active cell		Config 1,2,3	NR cell 1 (Pcell)				NR Cell 1 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3	NR cell 2				NR cell 2 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3	0		Gap not configured		As specified in TS 38.133 [6] clause 9.1.2-1.
Measurement gap offset		Config 1,2,3	39		N/A		
SMTC-SSB parameters on NR RF Channel 1		Config 1	SSB.1 FR1				As specified in clause A.3.1
		Config 2	SSB.1 FR1				As specified in clause A.3.1
		Config 3	SSB.2 FR1				As specified in clause A.3.1
SMTC-SSB parameters on NR RF Channel 2		Config 1,2,3	SSB.3 FR2				As specified in clause A.3.2
offsetMO	dB	Config 1,2,3	6				
Hysteresis	dB	Config 1,2,3	0				
a4-Threshold	dBm	Config 1,2,3	-105				
CP length		Config 1,2,3	Normal				
TimeToTrigger	s	Config 1,2,3	0				
Filter coefficient		Config 1,2,3	0				L3 filtering is not used
DRX		Config 1,2,3	DRX.1	DRX.2	DRX.1	DRX.2	DRX is used
Time offset between serving and neighbour cells		Config 1	3ms				Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		Config 2,3	3μs				Synchronous cells.
T1	s	Config 1,2,3	5				
T2	s	Config 1,2,3	8 for PC1; 5 for other PC	82 for PC1; 52 for other PC	8 for PC1; 5 for other PC	82 for PC1; 52 for other PC	PC1 - power class 1 as specified in TS 38.101-2 [3] Table 6.2.1.0

Table 7.6.2.6.4-3: Test Environment parameters for SA inter-frequency event triggered reporting without SSB time index detection in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 7.6.2.6.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram			

1. Message contents are defined in clause 7.6.2.6.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

3. If a UE supports per-FR gap it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

4. The UE Rx beam peak direction for Cell 2 has been obtained previously using one of the Rx beam peak search procedures as described in Annex I.7.6.2.6.4.2 Test procedure

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 2 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table 7.6.2.6.4.1-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table 7.6.2.6.4.1-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

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

2. Set the parameters according to T1 in Table 7.6.2.6.4.1-2. The TE shall ensure that the NR FR2 cell will be received by the UE from the Rx beam peak direction. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.2.6.4.1-2.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 7682 ms for UE supporting power class 1, or 4802 ms for UE supporting other power class for Test 1 and Test 3 and 81922 ms for UE supporting power class 1, or 51202 ms for UE supporting other power class for Test 2 and Test 4, then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = [(current cell 2 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

- transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.), or:
- switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

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

11. Repeat step 1-10 for each sub-test in Table 7.6.2.6.4.1-2 as appropriate.

7.6.2.6.4.3   Message contents

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

Table 7.6.2.6.4.3-1: Common Exception messages SA inter frequency event triggered reporting without SSB time index detection in DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Conditions GAP NEEDED and INTER-FREQ for Test 1 and Test 2 Table H.3.1-2 with Condition INTER-FREQ for Test 3 and Test 4 Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells Table H.3.1-4AA with A4-threshold= -105dB Table H.3.1-5 Table H.3.1-6 with Conditions gapUE and Pattern #0 for Test 1 and Test 2 Table H.3.1-7 with Condition INTER-FREQ Table H.3.7-1 with Condition DRX.1 for Test 1 and Test 3 and DRX.2 for Test 2 and Test 4

Table 7.6.2.6.4.3-2: MeasObjectNR-DEFAULT: SA FR1-FR2 measurement object configuration

Derivation Path: Table H.3.1-3			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectNR::= SEQUENCE {			
offsetMO SEQUENCE {			
rsrpOffsetSSB	dB6		
}			

7.6.2.6.5   Test requirement

Table 7.6.2.6.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.2.6.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 without SSB time index detection

Parameter		Unit	Test configuration	Cell 1		Cell 2	
				T1	T2	T1	T2
AoA setup			Config 1,2,3	NA		Setup 1 as specified in clause A.9	
NR RF Channel Number			Config 1,2,3	1		2	
Duplex mode			Config 1	FDD		TDD	
			Config 2,3	TDD		TDD	
TDD configuration			Config 1	Not Applicable		TDDConf.3.1	
			Config 2	TDDConf.1.1		TDDConf.3.1	
			Config 3	TDDConf.2.1		TDDConf.3.1	
$BW_{channel}$		MHz	Config 1	10: $N_{RB,c} = 52$		100: $N_{RB,c} = 66$	
			Config 2	10: $N_{RB,c} = 52$		100: $N_{RB,c} = 66$	
			Config 3	40: $N_{RB,c} = 106$		100: $N_{RB,c} = 66$	
BWP BW		MHz	Config 1	10: $N_{RB,c} = 52$		100: $N_{RB,c} = 66$	
			Config 2	10: $N_{RB,c} = 52$		100: $N_{RB,c} = 66$	
			Config 3	40: $N_{RB,c} = 106$		100: $N_{RB,c} = 66$	
BWP configuration	Initial DL BWP		Config 1,2,3	DLBWP.0.1		N/A	
	Initial UL BWP			ULBWP.0.1		N/A	
	Dedicated DL BWP			DLBWP.1.1		N/A	
	Dedicated UL BWP			ULBWP.1.1		N/A	
OCNG Patterns			Config 1,2,3	OP.1		OP.1	
PDSCH Reference measurement channel			Config 1	SR.1.1 FDD		-	
			Config 2	SR.1.1 TDD			
			Config 3	SR2.1 TDD			
RMSI CORESET Reference Channel			Config 1	CR.1.1 FDD		-	
			Config 2	CR.1.1 TDD			
			Config 3	CR2.1 TDD			
Dedicated CORESET RMC configuration			Config 1	CCR.1.1 FDD		CCR.3.1 TDD	
			Config 2	CCR.1.1 TDD		CCR.3.1 TDD	
			Config 3	CCR.2.1 TDD		CCR.3.1 TDD	

SMTC configuration		Config 1	SMTC.2	SMTC.2
		Config 2,3	SMTC.1	SMTC.1
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2	15	120
		Config 3	30	120
EPRE ratio of PSS to SSS		Config 1,2,3	0	0
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS(Note 1)				
EPRE ratio of OCNG to OCNG DMRS (Note 1)				
N_{oc} Note2	dBm/15 kHz Note5		NA Link only, see clause A.3.7A	-104.7
N_{oc} Note2	dBm/SCS Note4	Config 1,2		-95.7
		Config 3		-95.7
SSB_RP Note 3	dBm/SCS Note5	Config 1,2	-Infinity	-86.7
		Config 3	-Infinity	-86.7
$\hat{E}_s/I_{ot}$	dB	Config 1,2,3	-Infinity	9
$\hat{E}_s/N_{oc}$	dB	Config 1,2,3	-Infinity	9
Io Note3	dBm/9.36MHz	Config 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	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: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SSB_RP 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

In test 1 with per-UE gap and in test 3 without the 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 without the 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% with a confidence level of 95%.

> NOTE: The actual overall delays measured in the test may be up to $2 \times TTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

TTI insertion uncertainty = TTI_{DCCH} = 1 ms; $2 \times TTI_{DCCH}$ = 2 ms

The overall delays measured shall be less than a total of 7682 ms for power class 1 UE and 4802 ms for other power classes in test 1 and test 3 and 81922 for power class 1 UE and 51202 ms for other power classes in test 2 and test 4.

7.6.2.7 NR SA FR1-FR2 event-triggered reporting in non-DRX with SSB time index detection

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

7.6.2.7.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

7.6.2.7.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.6.2.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.2.7.

7.6.2.7.4 Test description

7.6.2.7.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.2.7.4.1-1.

Table 7.6.2.7.4.1-1: SA FR1-FR2 event triggered reporting tests in non-DRX with SSB time index detection supported test configurations

Test Case ID	Description of serving cell	Description of target cell
7.6.2.7-1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
7.6.2.7-2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	
7.6.2.7-3	NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	
Note 1: The UE is only required to be tested in one of the supported test configurations		
Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell		

Table 7.6.2.7.4.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection in non-DRX

Parameter	Unit	Test configuration	Value Test 1	Test 2	Comment
NR RF Channel Number		Config 1,2,3	1, 2		Two NR carrier frequencies is used
Active cell		Config 1,2,3	NR cell 1 (Pcell)		NR Cell 1 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3	NR cell 2		NR cell 2 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3	0	Gap not configured	As specified in TS 38.133 [6] clause 9.1.2-1
Measurement gap offset		Config 1,2,3	39	N/A	
SMTC-SSB parameters on NR RF Channel 1		Config 1	SSB.1 FR1		As specified in clause A.3.1
		Config 2	SSB.1 FR1		As specified in clause A.3.1
		Config 3	SSB.2 FR1		As specified in clause A.3.1
SMTC-SSB parameters on NR RF Channel 2		Config 1,2,3	SSB.3 FR2		As specified in clause A.3.2
offsetMO	dB	Config 1,2,3	6		
Hysteresis	dB	Config 1,2,3	0		
a4-Threshold	dBm	Config 1,2,3,4,5,6	-105		
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	7 for PC1; 4.5 for other PC	3.5 for PC1; 2.5 for other PC	PC1 - power class 1 as specified in TS 38.101-2 [3] Table 6.2.1.0

Table 7.6.2.7.4.1-3: Test Environment parameters for SA inter-frequency event triggered reporting with SSB time index detection in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 7.6.2.7.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram			

1. Message contents are defined in clause 7.6.2.7.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

3. If a UE supports per-FR gap it is only required to pass test 2. Otherwise it is only required to pass test 1.

4. The UE Rx beam peak direction for Cell 2 has been obtained previously using one of the Rx beam peak search procedures as described in Annex I.

7.6.2.7.4.2 Test procedure

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 2 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2.

In test 1 measurement gap pattern configuration # 0 as defined in Table 7.6.2.7.4.1-2 is provided for a UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table 7.6.2.7.4.1-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

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

2. Set the parameters according to T1 in Table 7.6.2.7.4.1-2. The TE shall ensure that the NR FR2 cell will be received by the UE from the Rx beam peak direction. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.2.7.4.1-2.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 6722 ms for UE supporting power class 1, or 4162 ms for UE supporting other power class for Test 1 and 3362 ms for UE supporting power class 1, or 2082 ms for UE supporting other power class for Test 2 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = [(current cell 2 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

- transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
or:
- switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

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

11. Repeat step 1-10 for each sub-test in Table 7.6.2.7.4.1-2 as appropriate.

7.6.2.7.4.3 Message contents

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

Table 7.6.2.7.4.3-1: Common Exception messages SA inter frequency event triggered reporting with SSB time index detection in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Conditions GAP NEEDED and INTER-FREQ for Test 1 Table H.3.1-2 with Condition INTER-FREQ for Test 2 Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells Table H.3.1-4AA with Condition SSB Index and A4-threshold= -105dB Table H.3.1-5 Table H.3.1-6 with Conditions gapUE and Pattern #0 for Test 1 Table H.3.1-7 with Condition INTER-FREQ

Table 7.6.2.7.4.3-2: MeasObjectNR-DEFAULT: SA FR1-FR2 measurement object configuration

Derivation Path: Table H.3.1-3			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectNR::= SEQUENCE {			
offsetMO SEQUENCE {			
rsrpOffsetSSB	dB6		
}			

7.6.2.7.5 Test requirement

Table 7.6.2.7.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.2.7.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection

Parameter		Unit	Test configuration	Cell 1		Cell 2	
				T1	T2	T1	T2
AoA setup			Config 1,2,3	NA		Setup 1 as specified in clause A.9	
Beam Assumption[Note 7]			Config 1,2,3	N/A		Rough	
NR RF Channel Number			Config 1,2,3	1		2	
Duplex mode			Config 1	FDD		TDD	
			Config 2,3	TDD		TDD	
TDD configuration			Config 1	Not Applicable		TDDConf.3.1	
			Config 2	TDDConf.1.1		TDDConf.3.1	
			Config 3	TDDConf.2.1		TDDConf.3.1	
$BW_{channel}$		MHz	Config 1	10: $N_{RB,c} = 52$		100: $N_{RB,c} = 66$	
			Config 2	10: $N_{RB,c} = 52$		100: $N_{RB,c} = 66$	
			Config 3	40: $N_{RB,c} = 106$		100: $N_{RB,c} = 66$	
BWP BW		MHz	Config 1	10: $N_{RB,c} = 52$		100: $N_{RB,c} = 66$	
			Config 2	10: $N_{RB,c} = 52$		100: $N_{RB,c} = 66$	
			Config 3	40: $N_{RB,c} = 106$		100: $N_{RB,c} = 66$	
BWP configuration	Initial DL BWP		Config 1,2,3	DLBWP.0.1		N/A	
	Initial UL BWP			ULBWP.0.1		N/A	
	Dedicated DL BWP			DLBWP.1.1		N/A	
	Dedicated UL BWP			ULBWP.1.1		N/A	
OCNG Patterns			Config 1,2,3	OP.1		OP.1	
PDSCH Reference measurement channel			Config 1	SR.1.1 FDD		-	
			Config 2	SR.1.1 TDD			
			Config 3	SR.2.1 TDD			
RMSI CORESET Reference Channel			Config 1	CR.1.1 FDD		-	
			Config 2	CR.1.1 TDD			
			Config 3	CR.2.1 TDD			
Dedicated CORESET RMC configuration			Config 1	CCR.1.1 FDD		CCR.3.1 TDD	
			Config 2	CCR.1.1 TDD		CCR.3.1 TDD	
			Config 3	CCR.2.1 TDD		CCR.3.1 TDD	
SMTC configuration			Config 1	SMTC.2		SMTC.2	
			Config 2,3	SMTC.1		SMTC.1	
PDSCH/PDCCH subcarrier spacing		kHz	Config 1,2	15		120	
			Config 3	30		120	

EPRE ratio of PSS to SSS					
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	0		0
EPRE ratio of PDCCH to PDCCH DMRS					
EPRE ratio of PDSCH DMRS to SSS					
EPRE ratio of PDSCH to PDSCH					
EPRE ratio of OCNG DMRS to SSS(Note 1)					
EPRE ratio of OCNG to OCNG DMRS (Note 1)					
$\hat{E}_s$	dBm/SCS	Config 1,2, 3		-Infinity	-87
SSB_RP Note 3	dBm/SCS Note5	Config 1,2		-Infinity	-87
		Config 3		-Infinity	-87
$\hat{E}_s / I_{ot}$ BB Note 8	dB	Config 1,2,3	NA Link only, see clause A.3.7A	-Infinity	14.69
	dBm/95.04 MHz Note5	Config 1,2,3		Infinity	-58.01
Propagation Condition		Config 1,2,3		AWGN	

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

Note 2:   Void

Note 3:   SSB_RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4:   Void

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

Note 7:   Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

Note 8:   Calculation of Es/Iot$_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMB$_S$ from TS 38.101-2 [19] Table 6.2.1.3-4.

In test 1 with per-UE 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 2 without the 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

     3360 for UE supporting power class 1, or

     2080 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% with a confidence level of 95%.

     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.

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 6722 ms for power class 1 UE and 4162 ms for other power classes in test 1 and 3362 for power class 1 UE and 2082 ms for other power classes in test 2

7.6.2.8 NR SA FR1-FR2 event-triggered reporting in DRX with SSB time index detection

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

7.6.2.8.1 Test purpose

The purpose of this test is to verify that the UE makes correct reporting of an event within inter-frequency cell search requirements.

7.6.2.8.2 Test applicability

This test applies to all types of NR UE Release 15 and forward supporting 5GS NR SA FR2 and long DRX cycle.

7.6.2.8.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.2.0.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.2.8.

7.6.2.8.4 Test description

7.6.2.8.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.2.8.4.1-1.

Table 7.6.2.8.4.1-1: SA FR1-FR2 event triggered reporting tests in DRX with SSB time index detection supported test configurations

Test Case ID	Description of serving cell	Description of target cell
7.6.2.8-1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
7.6.2.8-2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	
7.6.2.8-3	NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	
Note 1: The UE is only required to be tested in one of the supported test configurations		
Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell		

Table 7.6.2.8.4.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection in DRX

Parameter	Unit	Test configuration	Value				Comment
			Test 1	Test 2	Test 3	Test 4	
NR RF Channel Number		Config 1,2,3	1, 2				Two NR carrier frequencies is used.
Active cell		Config 1,2,3	NR cell 1 (Pcell)				NR Cell 1 is on NR RF channel number 1.
Neighbour cell		Config 1,2,3	NR cell 2				NR cell 2 is on NR RF channel number 2.
Gap Pattern Id		Config 1,2,3	0		Gap not configured		As specified in TS 38.133 [6] clause 9.1.2-1.
Measurement gap offset		Config 1,2,3	39		N/A		
SMTC-SSB parameters on NR RF Channel 1		Config 1	SSB.1 FR1				As specified in clause A.3.1
		Config 2	SSB.1 FR1				As specified in clause A.3.1
		Config 3	SSB.2 FR1				As specified in clause A.3.1
SMTC-SSB parameters on NR RF Channel 2		Config 1,2,3	SSB.3 FR2				As specified in clause A.3.2
offsetMO	dB	Config 1,2,3	6				
Hysteresis	dB	Config 1,2,3	0				
a4-Threshold	dBm	Config 1,2,3	-105				
CP length		Config 1,2,3	Normal				
TimeToTrigger	s	Config 1,2,3	0				
Filter coefficient		Config 1,2,3	0				L3 filtering is not used
DRX		Config 1,2,3	DRX.1	DRX.2	DRX.1	DRX.2	DRX is used
Time offset between serving and neighbour cells		Config 1	3ms				Asynchronous cells. The timing of Cell 2 is 3ms later than the timing of Cell 1.
		Config 2,3	3μs				Synchronous cells.
T1	s	Config 1,2,3	5				
T2	s	Config 1,2,3	11 for PC1; 6.5 for other PCT BD	108 for PC1; 67 for other PCT BD	11 for PC1; 6.5 for other PCT BD	108 for PC1; 67 for other PCT BD	PC1 - power class 1 as specified in TS 38.101-2 [3] Table 6.2.1.0

Table 7.6.2.8.4-3: Test Environment parameters for SA inter-frequency event triggered reporting with SSB time index detection in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 7.6.2.8.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram			

1. Message contents are defined in clause 7.6.2.8.4.3.

2. There are two NR cells on two carriers specified in the test. Cell 1 is the cell used for connection setup and Cell 2 is a target cell on a different carrier than Cell 1. The power levels and settings for Cell 2 are set according to Annex C.1.2.

3. If a UE supports per-FR, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

4. The UE Rx beam peak direction for Cell 2 has been obtained previously using one of the Rx beam peak search procedures as described in Annex I.

7.6.2.8.4.2 Test procedure

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 2 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table 7.6.2.8.4.1-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table 7.6.2.8.4.1-2 is provided for UE that support per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

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

2. Set the parameters according to T1 in Table 7.6.2.8.4.1-2. The TE shall ensure that the NR FR2 cell will be received by the UE from the Rx beam peak direction. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message.

4. The UE shall transmit *RRCReconfigurationComplete* message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 7.6.2.8.4.1-2.

6. UE shall transmit a *MeasurementReport* message triggered by Event A3. If the overall delays measured from the beginning of time period T2 is less than 10082 ms for UE supporting power class 1, or 6242 ms for UE supporting other power class for Test 1 and Test 3 and 107522 ms for UE supporting power class 1, or 66562 ms for UE supporting other power class for Test 2 and Test 4 then the number of successful tests is increased by one. If the UE fails to report the event within the overall delays measured requirement then the number of failure tests is increased by one.

7. After the SS receives the *MeasurementReport* message in step 6 or when T2 expires, the SS shall transmit *RRCRelease* message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.

8. Set Cell 2 physical cell identity = [(current cell 2 physical cell identity + 1) mod 1008] for next iteration of the test procedure loop.]

9. After the RRC connection release, the SS:

- transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.),
or:
- switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

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

11. Repeat step 1-10 for each sub-test in Table 7.6.2.8.4.1-2 as appropriate.

7.6.2.8.4.3 Message contents

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

Table 7.6.2.8.4.3-1: Common Exception messages SA inter frequency event triggered reporting with SSB time index detection in DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Conditions GAP NEEDED and INTER-FREQ for Test 1 and Test 2 Table H.3.1-2 with Condition INTER-FREQ for Test 3 and Test 4 Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells Table H.3.1-4AA with Condition SSB Index and A4-threshold= -105dB Table H.3.1-5 Table H.3.1-6 with Conditions gapUE and Pattern #0 for Test 1 and Test 2 Table H.3.1-7 with Condition INTER-FREQ Table H.3.7-1 with Condition DRX.1 for Test 1 and Test 3 and DRX.2 for Test 2 and Test 4

Table 7.6.2.8.4.3-2: MeasObjectNR-DEFAULT: SA FR1-FR2 measurement object configuration

Derivation Path: Table H.3.1-3			
Information Element	Value/remark	Comment	Condition
MeasObjectNR::= SEQUENCE {			
offsetMO SEQUENCE {			
rsrpOffsetSSB	dB6		
}			

7.6.2.8.5 Test requirement

Table 7.6.2.8.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.2.8.5-1: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 with SSB time index detection in DRX

Parameter		Unit	Test configuration	Cell 1		Cell 2	
				T1	T2	T1	T2
AoA setup			Config 1,2,3	NA		Setup 1 as specified in clause A.9	
Beam Assumption$^{Note 7}$			Config 1,2,3	N/A		Rough	
NR RF Channel Number			Config 1,2,3	1		2	
Duplex mode			Config 1	FDD		TDD	
			Config 2,3	TDD		TDD	
TDD configuration			Config 1	Not Applicable		TDDConf.3.1	
			Config 2	TDDConf.1.1		TDDConf.3.1	
			Config 3	TDDConf.2.1		TDDConf.3.1	
BW$_{channel}$		MHz	Config 1	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
			Config 2	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
			Config 3	40: $N_{RB,c}$ = 106		100: $N_{RB,c}$ = 66	
BWP BW		MHz	Config 1	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
			Config 2	10: $N_{RB,c}$ = 52		100: $N_{RB,c}$ = 66	
			Config 3	40: $N_{RB,c}$ = 106		100: $N_{RB,c}$ = 66	
BWP configuration	Initial DL BWP		Config 1,2,3	DLBWP.0.1		N/A	
	Initial UL BWP			ULBWP.0.1		N/A	
	Dedicated DL BWP			DLBWP.1.1		N/A	
	Dedicated UL BWP			ULBWP.1.1		N/A	
OCNG Patterns			Config 1,2,3	OP.1		OP.1	
PDSCH Reference measurement channel			Config 1	SR.1.1 FDD		-	
			Config 2	SR.1.1 TDD			
			Config 3	SR2.1 TDD			
RMSI CORESET Reference Channel			Config 1	CR.1.1 FDD		-	
			Config 2	CR.1.1 TDD			
			Config 3	CR2.1 TDD			
Dedicated CORESET RMC configuration			Config 1	CCR.1.1 FDD		CCR.3.1 TDD	
			Config 2	CCR.1.1 TDD		CCR.3.1 TDD	
			Config 3	CCR.2.1 TDD		CCR.3.1 TDD	

Parameter	Unit	Config			
SMTC configuration		Config 1	SMTC.2	SMTC.2	
		Config 2,3	SMTC.1	SMTC.1	
PDSCH/PDCCH subcarrier spacing	kHz	Config 1,2	15	120	
		Config 3	30	120	
EPRE ratio of PSS to SSS		Config 1,2,3	0	0	
EPRE ratio of PBCH DMRS to SSS					
EPRE ratio of PBCH to PBCH DMRS					
EPRE ratio of PDCCH DMRS to SSS					
EPRE ratio of PDCCH to PDCCH DMRS					
EPRE ratio of PDSCH DMRS to SSS					
EPRE ratio of PDSCH to PDSCH					
EPRE ratio of OCNG DMRS to SSS(Note 1)					
EPRE ratio of OCNG to OCNG DMRS (Note 1)					
N_{oc} Note2	dBm/15 kHz Note5			-104.7	
N_{oc} Note2	dBm/SCS Note4	Config 1,2		-95.7	
		Config 3		-95.7	
SSB_RP Note 3	dBm/SCS Note5	Config 1,2		-Infinity	-86.7
		Config 3		-Infinity	-86.7
$\hat{E}_s/I_{ot}$	dB	Config 1,2,3	NA Link only, see clause A.3.7A	-Infinity	9
$\hat{E}_s/N_{oc}$	dB	Config 1,2,3		-Infinity	9
Io Note3	dBm/9.36MHz	Config 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		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: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: SSB_RP 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

Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

In test 1 with per-UE gap and in test 3 without the 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 without the 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% with a confidence level of 95%.

    NOTE: The actual overall delays measured in the test may be up to $2 \times TTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

TTI insertion uncertainty = TTIDCCH = 1 ms; 2xTTIDCCH = 2 ms

The overall delays measured shall be less than a total of 10082 ms for power class 1 UE and 6240 ms for other power classes in test 1 and test 3 and 107522 for power class 1 UE and 66562 ms for other power classes in test 2 and test 4.

7.6.3 L1-RSRP measurement for beam reporting

7.6.3.0 Minimum conformance requirements for L1-RSRP measurement for beam reporting

7.6.3.0.1 Minimum conformance requirements for SSB-based L1-RSRP measurement for beam reporting

Same as clause 5.6.3.0.1

The normative reference for this requirement is TS 38.133 [6] clause 9.5.3.1, 9.5.4.1 and 9.5.5.1.

7.6.3.0.2 Minimum conformance requirements for CSI-RS-based L1-RSRP measurement for beam reporting

Same as clause 5.6.3.0.2

The normative reference for this requirement is TS 38.133 [6] clauses 9.5.3.1, 9.5.4.2 and 9.5.5.2.

7.6.3.1 NR SA FR2 SSB-based L1-RSRP measurement in non-DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test case is incomplete for extreme conditions

7.6.3.1.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement in non-DRX within L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5.4.1.

7.6.3.1.2   Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.6.3.1.3   Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.3.1.

7.6.3.1.4   Test description

7.6.3.1.4.1   Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.3.1.4.1-1.

Table 7.6.3.1.4.1-1: NR SA FR2 SSB-based L1-RSRP measurement in non-DRX supported test configurations

Test Case ID	Description
7.6.3.1-1	NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
7.6.3.1-2	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

Table 7.6.3.1.4.1-2: General test parameters for NR SA FR2 SSB-based L1-RSRP measurement in non-DRX

Parameter	Config	Unit	Value
SSB GSCN	1~2		freq1
Duplex mode	1~2		TDD
TDD Configuration	1~2		TDDConf.3.1
BW$_{channel}$	1~2	MHz	100: $N_{RB,c}$ = 66
Data RBs allocated	1~2		66
PDSCH Reference measurement channel	1		SR.3.1 TDD
			SR.3.3 TDD
RMSI CORESET Reference Channel	1		CR.3.1 TDD
	2		CR.3.2 TDD
Dedicated CORESET Reference Channel	1		CCR.3.1 TDD
	2		CCR.3.7 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 Configuration	1~2			TCI.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		320
T1	1~2	s		5
T2	1~2	s		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 to PDCCH DMRS	1~2	dB		0
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH DMRS				
EPRE ratio of OCNG DMRS to SSS[Note 1]				
EPRE ratio of OCNG to OCNG DMRS [Note 1]				
Propagation condition	1~2			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.				

Table 7.6.3.1.4-3: Test Environment parameters for NR SA FR2 SSB-based L1-RSRP measurement in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 7.6.3.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1-1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram			

1. Message contents are defined in clause 7.6.3.1.4.3.

2. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I.

7.6.3.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 7.6.3.1.4.1-2. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On,* according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 6.6.4.1.4.1-2.

2. Set the parameters according to T1 in Table 7.6.3.1.5-1. T1 starts.

3. The UE shall be transmitting CSI on PUCCH with a periodicity of 320 slots.

4. When T1 expires, the SS shall set the parameters according to T2 in 7.6.3.1.5-1. T2 starts.

5. The UE shall start sending valid L1-RSRP reports. The SS shall check the following requirements:

   - R1: the UE shall start to transmit valid L1-RSRP reports no later than 1760ms for UE supporting power class 1 in configuration 1, no later than 1720 ms for UE supporting power class 1 in configuration 2, no later than 1280 ms for UE supporting power class other than 1 in configuration 1 and no later than 1240 ms for UE supporting power class other than 1 in configuration 2 from the beginning of time period T2. A valid report shall meet the absolute L1-RSRP requirement for SSB#1 Table 5.6.3.1.5-2 for test configuration 1 and the corresponding absolute accuracy requirements in Table 5.6.3.1.5-3 for test configuration 2. If the first valid report is received before the specified time, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   - R2: the UE shall transmit L1-RSRP reports every 320 slots. If the reports are received accordingly, the number of passed iterations for R2 is increased by one. Otherwise, the number of failed iterations for R2 is increased by one.

   - R3: The L1-RSRP value of SSB#1 reported by the UE is compared to the expected L1-RSRP value for SSB#1. In all consecutive reports after the first valid value is received, if the resulting value is outside the corresponding absolute accuracy requirements in Table 7.6.3.1.5-2 for test configuration 1 and the corresponding absolute accuracy requirements in Table 7.6.3.1.5-3 for test configuration 2 the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

   - R4: The DIFF-RSRP value of SSB#0 reported by the UE is compared to the expected DIFF-RSRP value. In all consecutive reports after the first valid value is received, if the resulting value is outside the corresponding relative accuracy requirements in Table 7.6.3.1.5-4 for all test configurations, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

6. The SS waits until T2 expires.

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

8. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

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

7.6.3.1.4.3 Message contents

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

Table 7.6.3.1.4.3-1: Common Exception messages NR SA FR2 SSB-based L1-RSRP measurement in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.6-2 with conditions PERIODIC and SS-RSRP Table H.3.6-3 with condition SSB

Table 7.6.3.1.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSBs.	
detectionResource CHOICE {			
ssb-Index	0		
}			
}			
}			

7.6.3.1.5   Test requirement

Table 7.6.3.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.3.1.5-1: Cell specific test parameters for NR SA FR2 SSB-based L1-RSRP measurement in non-DRX

Parameter	Config	Unit	SSB#0		SSB#1	
			T1	T2	T1	T2
Angle of arrival configuration			Setup 1 according to A.9			
Assumption for UE beamsNote 4	1~2		Rough			
N_{oc} Note2	1~2	dBm/15kHz	-105			
N_{oc} Note2	1	dBm/SSB SCS	-96			
	2		-93			
$\hat{E}_s/I_{ot}$	1~2	dB	0	0	-Infinity	9
SSB_RP Note3	1	dBm/SSB SCS	-96	-96	-Infinity	-87
	2		-93	-93	-Infinity	-84
Io Note3	1	dBm/95.04MHz	-63.97	-63.97	-66.98	-57.47
	2		-63.97	-63.97	-66.98	-57.47
$\hat{E}_s/N_{oc}$	1~2	dB	0	0	-Infinity	9
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: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.						
Note 4: Information about types of UE beam is given in TS 38.133 Annex B.2.1.3, and does not limit UE implementation or test system implementation						

The UE shall send L1-RSRP report every 320 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.

Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 7.6.3.1.5-2 for for test configuration 1 and the corresponding absolute accuracy requirements in Table 7.6.3.1.5-3 for test configuration 2 and the corresponding relative accuracy requirements in Table 7.6.3.1.5-4 for all test configurations.

Table 7.6.3.1.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configuration 1

Normal Conditions	T1	T2
Lowest reported value (SSB#1)	-	40
Highest reported value (SSB#1)	-	99

Table 7.6.3.1.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configuration 2

Normal Conditions	T1	T2
Lowest reported value (SSB#1)	-	43
Highest reported value (SSB#1)	-	102

Table 7.6.3.1.5-4: L1-RSRP relative accuracy requirements for the reported values for all test configurations

	T1	T2
Lowest DIFF RSRP reported (SSB#0)	-	1
Highest DIFF RSRP reported (SSB#0)	-	7

For the test to pass, the ratio of successful reported valued for each requirement (R1 to R4) shall be at least 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

7.6.3.2 NR SA FR2 SSB-based L1-RSRP measurement in DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test case is incomplete for extreme conditions

7.6.3.2.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement in DRX within L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5.4.1.

7.6.3.2.2 Test applicability

This test applies to all types of NR UE Release 15 and forward supporting 5GS NR SA FR2 and long DRX cycle.

7.6.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.3.2.

7.6.3.2.4 Test description

7.6.3.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.3.2.4.1-1.

Table 7.6.3.2.4.1-1: NR SA FR2 SSB-based L1-RSRP measurement in DRX supported test configurations

Test Case ID	Description
7.6.3.2-1	NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
7.6.3.2-2	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

Table 7.6.3.2.4.1-2: General test parameters for NR SA FR2 SSB-based L1-RSRP measurement in DRX

Parameter	Config	Unit	Value
SSB GSCN	1~2		freq1
Duplex mode	1~2		TDD
TDD Configuration	1~2		TDDConf.3.1
BW$_{channel}$	1~2	MHz	100: N$_{RB,c}$ = 66
Data RBs allocated	1~2		66
PDSCH Reference measurement channel	1		SR.3.1 TDD
	2		SR.3.3 TDD
RMSI CORESET Reference Channel	1		CR.3.1 TDD
	2		CR.3.2 TDD
Dedicated CORESET Reference Channel	1		CCR.3.1 TDD
	2		CCR.3.7 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 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	320
T1	1~2	s	5
T2	1~2	s	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	1~2	dB	0
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS[Note 1]			
EPRE ratio of OCNG to OCNG DMRS [Note 1]			
Propagation condition	1~2		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.			

Table 7.6.3.2.4-3: Test Environment parameters for NR SA FR2 SSB-based L1-RSRP measurement in DRX

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.	

Channel bandwidth	As specified by the test configuration selected from Table 7.6.3.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1-1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram			

1. Message contents are defined in clause 7.6.3.2.4.3.

2. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I.

7.6.3.2.4.2 Test procedure

Same as in 7.6.3.1.4.2 with the following exception:

5. The UE shall start sending valid L1-RSRP reports. The SS shall check the following requirements:

- R1: the UE shall start to transmit valid L1-RSRP reports no later than 2960ms for UE supporting power class 1 in configuration 1, no later than 2920ms for UE supporting power class 1 in configuration 2, no later than 2000ms for UE supporting power class other than 1 in configuration 1 and no later than 1960 ms for UE supporting power class other than 1 in configuration 2 from the beginning of time period T2. A valid report shall meet the absolute L1-RSRP requirement for SSB#1 Table 5.6.3.1.5-2 for test configuration 1 and the corresponding absolute accuracy requirements in Table 5.6.3.1.5-3 for test configuration 2. If the first valid report is received before the specified time, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

- R2: the UE shall transmit L1-RSRP reports every 320 slots. If the reports are received accordingly, the number of passed iterations for R2 is increased by one. Otherwise, the number of failed iterations for R2 is increased by one.

-R3: The L1-RSRP value of SSB#1 reported by the UE is compared to the expected L1-RSRP value for SSB#1. In all consecutive reports after the first valid value is received, if the resulting value is outside the corresponding absolute accuracy requirements in Table 7.6.3.2.5-2 for test configurations 1 and 2 and the corresponding absolute accuracy requirements in Table 7.6.3.2.5-3 for test configurations 3 and 4 the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

-R4: The DIFF-RSRP value of SSB#0 reported by the UE is compared to the expected DIFF-RSRP value. In all consecutive reports after the first valid value is received, if the resulting value is outside the corresponding relative accuracy requirements in Table 7.6.3.2.5-4 for all test configurations, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

7.6.3.2.4.3 Message contents

Same message content as in subclause 7.6.3.1.4.3 with the following exception:

Table 7.6.3.2.4.3-1: Common Exception messages NR SA FR2 SSB-based L1-RSRP measurement in DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.7-1 with condition DRX.3

7.6.3.2.5   Test requirement

Table 7.6.3.2.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.3.2.5-1: Cell specific test parameters for NR SA FR2 SSB-based L1-RSRP measurement in DRX

Parameter	Config	Unit	SSB#0		SSB#1	
			T1	T2	T1	T2
Angle of arrival configuration			Setup 1 according to A.9			
Assumption for UE beamsNote 4	1~2		Rough			
N_{oc} Note2	1~2	dBm/15kHz	-105			
N_{oc} Note2	1	dBm/SSB SCS	-96			
	2		-93			
$\hat{E}_s/I_{ot}$	1~2	dB	0	0	-Infinity	9
SSB_RP Note3	1	dBm/SSB SCS	-96	-96	-Infinity	-87
	2		-93	-93	-Infinity	-84
Io Note3	1	dBm/95.04MHz	-63.97	-63.97	-66.98	-57.47
	2		-63.97	-63.97	-66.98	-57.47
$\hat{E}_s/N_{oc}$	1~2	dB	0	0	-Infinity	9
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: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.						
Note 4: Information about types of UE beam is given in TS 38.133 Annex B.2.1.3, and does not limit UE implementation or test system implementation						

The UE shall send L1-RSRP report every 320 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.

Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 7.6.3.2.5-2 for test configuration 1 and the corresponding absolute accuracy requirements in Table 7.6.3.2.5-3 for test configuration 2 and the corresponding relative accuracy requirements in Table 7.6.3.2.5-4 for all test configurations.

Table 7.6.3.2.5-2: L1-RSRP absolute accuracy requirements for the reported values for test configuration 1

Normal Conditions	T1	T2
Lowest reported value (SSB#1)	-	40
Highest reported value (SSB#1)	-	99

Table 7.6.3.2.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configuration 2

Normal Conditions	T1	T2
Lowest reported value (SSB#1)	-	43
Highest reported value (SSB#1)	-	102

Table 7.6.3.2.5-4: L1-RSRP relative accuracy requirements for the reported values for all test configurations

	T1	T2
Lowest DIFF RSRP reported (SSB#0)	-	1
Highest DIFF RSRP reported (SSB#0)	-	7

For the test to pass, the ratio of successful reported valued for each requirement (R1 to R4) shall be at least 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

7.6.3.3 NR SA FR2 CSI-RS-based L1-RSRP measurement in non-DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test case is incomplete for extreme conditions

7.6.3.3.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement in non-DRX within L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5.4.2.

7.6.3.3.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.6.3.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.3.3.

7.6.3.3.4 Test description

7.6.3.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.3.3.4.1-1.

Table 7.6.3.3.4.1-1: NR SA FR2 CSI-RS-based L1-RSRP measurement in non-DRX supported test configurations

Test Case ID	Description
7.6.3.4-1	NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode

Table 7.6.3.3.4.1-2: General test parameters for NR SA FR2 CSI-RS-based L1-RSRP measurement in non-DRX

Parameter	Config	Unit	Value
SSB GSCN	1		freq1
Duplex mode	1		TDD
TDD Configuration	1		TDDConf.3.1
BW$_{channel}$	1	MHz	100: $N_{RB,c}$ = 66
Data $_{RBs}$ allocated	1		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		8
Propagation condition	1		AWGN
T1	1	s	5
EPRE ratio of PSS to SSS	1	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS[Note 1]			
EPRE ratio of OCNG to OCNG DMRS [Note 1]			
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 7.6.3.3.4-3: Test Environment parameters for NR SA FR2 CSI-RS-based L1-RSRP measurement in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 7.6.3.3.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1-1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram			

1. Message contents are defined in clause 7.6.3.3.4.3.

2. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I.

7.6.3.3.4.2 Test procedure

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. Prior to the start of the time duration T1, the UE shall be fully synchronized to PCell. UE is also configured to measure L1-RSRP based on SSB. Upon receiving the DCI trigger, UE provides the report back based on the reporting configuration as defined in table 7.6.3.3.4.1-2.

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

2. Set the parameters according to T1 in Table 7.6.3.3.5-1. T1 starts.

3. After 480ms from the start of the test the SS transmits the DCI trigger in slot 1.

4. The SS shall check following requirements:

   - R1: the UE shall send L1-RSRP report at slot 8 from the reception of DCI trigger. If the report is received at slot 8 from the reception of DCI trigger, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   - R2: the L1-RSRP value of CSI-RS#1 reported by the UE is compared to the expected L1-RSRP value for CSI-RS #1. If the resulting value is outside the limits in Table 7.6.3.3.5-2 or the UE fails to report the measurement value for CSI-RS #1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

   - R3: The DIFF RSRP value of CSI-RS #0 reported by the UE is compared to the expected DIFF RSRP value. If the resulting value is outside the limits in Table 7.6.3.3.5-4 or the UE fails to report the measurement value for CSI-RS #0, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

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

7. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure

parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

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

7.6.3.3.4.3 Message contents

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

Table 7.6.3.3.4.3-1: Common Exception messages NR SA FR2 CSI-RS-based L1-RSRP measurement in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.6-2 with conditions APERIODIC and CSI-RSRP Table H.3.6-3 with conditions CSI-RS and APERIODIC

Table 7.6.3.3.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSBs.	
}			
}			

7.6.3.3.5 Test requirement

Table 7.6.3.3.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.3.3.5-1: Cell specific test parameters for NR SA FR2 CSI-RS-based L1-RSRP measurement in non-DRX

Parameter	Config	Unit	CSI-RS#0	CSI-RS#1
Angle of arrival configuration	1		Setup 1 according to A.9	
N_{oc} Note1	1	dBm/15kHz	-105	
N_{oc} Note1	1	dBm/SSB SCS	-95.97	
$\hat{E}_s/I_{ot}$	1	dB	0	9
CSI-RS RSRP Note2	1	dBm/SSB SCS	-95.97	-86.97
Io Note2	1	dBm/95.04MHz	-63.97	-57.47
$\hat{E}_s/N_{oc}$	1	dB	0	9
Note 1: Void 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.				

After 480ms from the beginning of the test, the UE shall send L1-RSRP report at slot 8 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. Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 7.6.3.3.5-2 the corresponding relative accuracy requirements in Table 7.6.3.3.5-3.

Table 7.6.3.3.5-2: L1-RSRP absolute accuracy requirements for the reported values

Normal Conditions	T1
Lowest reported value (CSI-RS#1)	40
Highest reported value (CSI-RS#1)	99

Table 7.6.3.3.5-3: L1-RSRP relative accuracy requirements for the reported values

	T1
Lowest DIFF RSRP reported (CSI-RS#0)	1
Highest DIFF RSRP reported (CSI-RS#0)	7

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

NOTE: The actual overall delays measured in the test may be up to 2xTTI_{DCCH} higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

7.6.3.4 NR SA FR2 CSI-RS-based L1-RSRP measurement in DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test case is incomplete for extreme conditions

7.6.3.4.1 Test purpose

To verify that the UE makes correct reporting of L1-RSRP measurement in DRX within L1-RSRP measurement requirements in TS 38.133 [6] clause 9.5.4.2.

7.6.3.4.2 Test applicability

This test applies to all types of NR UE Release 15 and forward supporting 5GS NR SA FR2 and long DRX cycle.

7.6.3.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.3.4.

7.6.3.4.4 Test description

7.6.3.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.3.4.4.1-1.

Table 7.6.3.4.4.1-1: NR SA FR2 CSI-RS-based L1-RSRP measurement in DRX supported test configurations

Test Case ID	Description
7.6.3.4-1	NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode

Table 7.6.3.4.4.1-2: General test parameters for NR SA FR2 CSI-RS-based L1-RSRP measurement in DRX

Parameter	Config	Unit	Value
SSB GSCN	1		freq1
Duplex mode	1		TDD
TDD Configuration	1		TDDConf.3.1
$BW_{channel}$	1	MHz	100: $N_{RB,c} = 66$
Data $_{RBs}$ allocated	1		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		8
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	1	dB	0
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS[Note 1]			
EPRE ratio of OCNG to OCNG DMRS [Note 1]			
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 7.6.3.4.4-3: Test Environment parameters for NR SA FR2 CSI-RS-based L1-RSRP measurement in DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 7.6.3.4.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1-1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram			

1. Message contents are defined in clause 7.6.3.4.4.3.

2. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I.

7.6.3.4.4.2 Test procedure

Same test procedure as in subclause 7.6.3.3.4.2 with tables 7.6.3.3.4.1-2 and 7.6.3.3.5-1 replaced by tables 7.6.3.4.4.1-2 and 7.6.3.4.5-1 and following change in step 3.

3. After 1440ms from the start of the test the SS transmits the DCI trigger in slot 1.

7.6.3.4.4.3 Message contents

Same message content as in subclause 7.6.3.3.4.3 with the following exception:

Table 7.6.3.4.4.3-1: Common Exception messages NR SA FR2 CSI-RS-based L1-RSRP measurement in DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.7-1 with condition DRX.3

7.6.3.4.5 Test requirement

Table 7.6.3.4.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.3.4.5-1: Cell specific test parameters for NR SA FR2 CSI-RS-based L1-RSRP measurement in DRX

Parameter	Config	Unit	CSI-RS#0	CSI-RS#1
Angle of arrival configuration	1		Setup 1 according to A.9	
Assumption for UE beams[Note 3]	1~2		Rough	
N_{oc} [Note1]	1	dBm/15kHz	-105	
N_{oc} [Note1]	1	dBm/SSB SCS	-95.97	
$\hat{E}_s / I_{ot}$	1	dB	0	9
CSI-RS RSRP [Note2]	1	dBm/SSB SCS	-95.97	-86.97
Io [Note2]	1	dBm/95.04MHz	-63.97	-57.47
$\hat{E}_s / N_{oc}$	1	dB	0	9
Note 1: Void 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. Note 4: Information about types of UE beam is given in TS 38.133 Annex B.2.1.3, and does not limit UE implementation or test system implementation				

After 1440ms from the beginning of the test, the UE shall send L1-RSRP report at slot 8 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. Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 7.6.3.4.5-2 the corresponding relative accuracy requirements in Table 7.6.3.4.5-3.

Table 7.6.3.4.5-2: L1-RSRP absolute accuracy requirements for the reported values

Normal Conditions	T1
Lowest reported value (CSI-RS#1)	40
Highest reported value (CSI-RS#1)	99

Table 7.6.3.4.5-3: L1-RSRP relative accuracy requirements for the reported values

	T1
Lowest DIFF RSRP reported (CSI-RS#0)	1
Highest DIFF RSRP reported (CSI-RS#0)	7

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

NOTE: The actual overall delays measured in the test may be up to 2xTTI_{DCCH} higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

7.6.4 CLI measurements

7.6.4.0 Minimum conformance requirements

7.6.4.0.1 Minimum conformance requirements for SRS-RSRP measurement period

The UE shall be capable of performing SRS-RSRP measurement based on the configured SRS resource, and the UE shall be capable of reporting SRS-RSRP measured over measurement period of $T_{SRS\_RSRP\_measurement\_period}$ for FR1 and FR2.

Table 7.6.4.0.1-1 Measurement period T$_{SRS\_RSRP\_measurement\_period}$

Configuration	T$_{SRS\_measurement\_period}$ (ms)
No DRX	Max(60, 3 X T$_{SRS}$)
DRX cycle ≤ 320ms	Max(60, Ceil(1.5 X 3) X max(T$_{SRS}$, T$_{DRX}$))
DRX cycle > 320ms	3 X T$_{DRX}$
Note:	T$_{SRS}$ is SRS measurement periodicity configured *SRS-PeriodicityAndOffset*, and T$_{DRX}$ is the DRX cycle length.

If the SRS resources configured for measurement are partially or fully overlapping with SMTC window, SSB or CSI-RS configured for RLM, BFD, CBD or L1-RSRP measurement or measurement gaps, requirements are not specified for T$_{SRS\_RSRP\_measurement\_period}$.

When configured by the network, the UE shall be able to perform SRS-RSRP measurements of configured *srs-ResourceConfigCLI*. The requirements apply when the subcarrier spacing for SRS-RSRP measurement resource configuration is the same as the subcarrier spacing of the active DL BWP of serving cell. The UE is not required to measure SRS using different SCS compared to the downlink active BWP SCS of the same carrier.

The requirements as provided:

- SRS resources configured for SRS-RSRP measurements are measurable.

An SRS resource configured for SRS-RSRP shall be considered measurable when for each relevant SRS the following conditions are met:

- SRS-RSRP related side conditions given in clauses 10.1.22.1 for FR1 and FR2 for a corresponding band,

- SRS_RP and SRS Ês/Iot according to Annex B.2.7 for a corresponding band.

The UE shall send SRS-RSRP reports only for report configurations according to *reportType* which is *cliPeriodical* or *cliEventTriggered* when SRS-RSRP report is configured.

The UE shall report the SRS-RSRP value as a 7-bit value in the range [-140, -44] dBm with 1dB step size according to clause 10.1.22.1 for FR1 and FR2.

Reported SRS-RSRP measurements contained in periodically triggered measurement reports shall meet the requirements in clause 10.1.22.1.

Reported SRS-RSRP measurements contained in periodically triggered measurement reports shall meet the requirements in clauses 10.1.22.1.

The first report in event triggered periodic measurement reporting shall meet the requirements specified in clause 9.7.2.3.3.

Reported SRS-RSRP measurements contained in periodically triggered measurement reports shall meet the requirements in clause 10.1.22.1.

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 x TTI$_{DCCH}$. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report on.

The normative reference for this requirement is TS 38.133 [6] clause 9.7.2.5 and 9.7.2.1, 9.7.2.2 and 9.7.2.3

7.6.4.1 NR SA FR2 SRS-RSRP measurement in non-DRX

Editor's Note: This test case is incomplete. Following aspects are either missing or TBD

- The test applicability is FFS

- The test procedure is incomplete

- The message content is FFS

- MU/TT analysis is FFS

7.6.4.1.1   Test purpose

The purpose of this test case is to verify that the UE makes correct reporting of SRS-RSRP measurement in non-DRX within SRS-RSRP measurement requirements in TS 38.133 [6] clause 9.7.2.5

7.6.4.1.2   Test applicability

FFS

7.6.4.1.3   Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.4.0.1

The normative reference for this requirement is TS 38.133 [6] clause 9.7.2.5 and A.7.6.4.1.

7.6.4.1.4   Test description

One cell is deployed in the test, which is FR2 PCell (Cell 1).

7.6.4.1.4.1   Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.4.1.4.1-1.

Table 7.6.4.1.4.1-1: Supported test configurations

Test Case ID	Description
7.6.4.1 - 1	NR 120 kHz SRS SCS, 100 MHz bandwidth, TDD duplex mode

Configure the test equipment and the DUT according to the parameters in Table 7.6.4.1.4.1-2.

Table 7.6.4.1.4.1-2: Initial conditions SA FR2 SRS-RSRP measurement in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.6.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. The test parameters are given in Table 7.6.4.1.4.1-3 below.

2. Message contents are defined in clause 7.6.4.1.4.3.

3. One cell is deployed in the test, which is FR2 PCell (Cell 1).. The test parameters for PSCell is given in Table A.7.6.4.1.4.1-3

4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

Table 7.6.4.1.4.1-3: General test parameters for SRS-RSRP event triggered reporting for PCell in FR2

Parameter	Unit	Test configuration	Value	Comment
Active cell		1	Cell 1	
RF Channel Number		1	1: Cell 1	
SSB configuration		1	SSB.1 FR2	
SMTC configuration		1	SMTC.1	
SRS configuration		1	SRSConf.1	Table A.7.6.4.1.2-4
CP length		1	Normal	
i1-Threshold	dBm	1	-103	
Hysteresis	dB	1	0	
Time To Trigger	s	1	0	
Filter coefficient		1	0	L3 filtering is not used
DRX	ms	1	OFF	Non-DRX
Time offset between DL from serving cell and SRS from test system	μs	1	10.67	
T1	s	1	5	
T2	s	1	1	

7.6.4.1.4.2   Test procedure

There is one cell is deployed in the test, which is FR2 PSCell (Cell 1)

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 I1 is used. The test consists of two successive time periods, with time duration of T1 and T2, respectively.

During the test, the test system transmits SRS resource for measurement in the DL slot according to the SRS configuration in Table 7.6.4.1.5-3 and the test parameters for the (virtual) neighbour cell UE in Table 7.6.4.1.5-23. During the test, the test system does not transmit PDCCH/PDSCH/OCNG on SRS symbol to be transmitted and on 2 data symbols before SRS to be transmitted.

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

2. Set the parameters according to Table 7.6.4.1.5-1 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1 with event I1 configured..

4. The UE shall transmit an RRCReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

    <rest of the steps are FFS >

7.6.4.1.4.3   Message contents

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

    FFS

7.6.4.1.5   Test requirement

Table 7.6.4.1.5-1 defines the cell specific settings for all tests. Table 7.6.4.1.5-2 defines the OTA primary level settings including test tolerances for all tests.

Table 7.6.4.1.5-1: NR Cell specific test parameters for SA SRS-RSRP event triggered reporting for PCell in FR2

Parameter	Unit	Test configuration	Cell 1	
			T1	T2
TDD configuration		1	TDDConf.3.1	
PDSCH RMC configuration		1	SR.3.1 TDD	
RMSI CORESET RMC configuration		1	CR.3.1 TDD	
Dedicated CORESET RMC configuration		1	CCR.3.1 TDD	
OCNG Patterns		1	OP.1	
TRS configuration			TRS.2.1. TDD	
PDSCH/PDCCH TCI state		1	TCI.State.2	
Initial BWP configuration		1	DLBWP.0.1 ULBWP.0.1	
Active DL BWP configuration		1	DLBWP.1.1	
Active UL BWP configuration		1	ULBWP.1.1	
Propagation Condition		1	AWGN	

Table 7.6.4.1.5-2: NR OTA Cell specific test parameters for SA SRS-RSRP event triggered reporting for PCell and neighbour cell UE in FR2

Parameter	Unit	Test configuration	Cell 1		Neighbour cell UE	
			T1	T2	T1	T2
AoA setup		1	Setup 1 defined in A.3.15.1			
Beam assumption Note 4		1	Fine			
N_{oc} Note 2	dBm/15 kHz	1	-98		-98	
N_{oc} Note 2	dBm/SCS	1	-89		-89	
$\hat{E}_s/I_{ot}$	dB	1	-	-	-infinity	4
$\hat{E}_s/N_{oc}$	dB	1	-	-	-infinity	4
SRS-RSRP Note 3	dBm/SCS kHz	1	-	-	-infinity	-94
Io	dBm/95.04 MHz	1	-70.01	-68.82	-70.01	-68.82
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: SRS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.						
Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.						

Table7.6.4.1.5-3: SRS configuration for measurement reporting

	Field	SRSConf.1	Comments
SRS-ResourceSet	srs-ResourceSetId	0	
	srs-ResourceIdList	0	
	resourceType	Periodic	
	Usage	Codebook	
SRS-Resource	SRS-ResourceId	0	
	nrofSRS-Ports	Port1	
	transmissionComb	n2	
	combOffset-n2	0	
	cyclicShift-n2	0	
	resourceMapping startPosition	0	
	resourceMapping nrofSymbols	n1	
	resourceMapping repetitionFactor	n1	
	freqDomainPosition	0	
	freqDomainShift	0	
	freqHopping c-SRS	12	
	freqHopping b-SRS	0	
	freqHopping b-hop	0	
	groupOrSequenceHopping	Neither	
	resourceType	Periodic	
	periodicityAndOffset	sl40, 25	
	sequenceId	0	Any 10 bit number

The UE shall send one Event I1 triggered measurement report, with a measurement reporting delay less than 60 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%.

NOTE: The actual overall delays measured in the test may be up to $2 \times TTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

7.6.5

7.6.6 L1-SINR measurement for beam reporting

7.6.6.0 Minimum conformance requirements

7.6.6.0.1 L1-SINR reporting with CSI-RS based CMR and no dedicated IMR configured

Same as clause 5.6.5.0.1

The normative reference for this requirement is TS 38.133 [6] clause 9.8.3, 9.8.4.1 and 9.8.5.

7.6.6.0.2 L1-SINR reporting with SSB based CMR and dedicated IMR configured

Same as clause 5.6.5.0.2

The normative reference for this requirement is TS 38.133 [6] clauses 9.8.3, 9.8.4.2 and 9.8.5.

7.6.6.0.3 L1-SINR reporting with CSI-RS based CMR and dedicated IMR configured

Same as clause 5.6.5.0.3

The normative reference for this requirement is TS 38.133 [6] clauses 99.8.3, 9.8.4.3 and 9.8.5.

7.6.6.1 NR SA FR2 CSI-RS based CMR and no dedicated IMR L1-SINR measurement in non-DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test case is incomplete for extreme conditions

7.6.6.1.1 Test purpose

To verify that the UE makes correct reporting of L1-SINR measurement in non-DRX within L1-SINR measurement requirements in TS 38.133 [6] clause 9.8.4.1.

7.6.6.1.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and supporting L1-SINR measurement.

7.6.6.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.6.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.6.1.

7.6.6.1.4 Test description

7.6.6.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.6.1.4.1-1.

Table 7.6.6.1.4.1-1: Applicable NR configurations for FR2 CSI-RS based CMR and no dedicated IMR L1-SINR measurement

Config	Description
1	NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode
Note:	The UE is only required to be tested in one of the supported test configurations

Table 7.6.6.1.4.1-2: General test parameters for FR2 CSI-RS based CMR and no dedicated IMR L1-SINR measurement

Parameter	Config	Unit	Value
SSB GSCN	1		freq1
Duplex mode	1		TDD
TDD Configuration	1		TDDConf.3.1
BW$_{channel}$	1	MHz	100: N$_{RB,c}$ = 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-SINR
reportQuantity-r16	1		cri-SINR-r16
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	1	dB	0
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS [Note 1]			
EPRE ratio of OCNG to OCNG DMRS [Note 1]			
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 7.6.6.1.4.1-3: Test Environment parameters for FR2 CSI-RS based CMR and no dedicated IMR L1-SINR measurement

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 7.6.6.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1-1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram			

1. Message contents are defined in clause 7.6.6.1.4.3.

2. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I.

7.6.6.1.4.2   Test procedure

The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-SINR on aperiodic CSI-RS resources. Prior to the start of the time duration T1, the UE shall be fully synchronized to PCell. UE is also configured to measure L1-SINR based on SSB. Upon receiving the DCI trigger, UE provides the report back based on the reporting configuration as defined in table 7.6.6.1.4.1-2.

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

2. Set the parameters according to T1 in Table 7.6.6.1.5-1. T1 starts.

3. After 160ms from the start of the test the SS transmits the DCI trigger in slot 8.

4. The SS shall check following requirements:

   - R1:   the UE shall send L1-SINR report at slot 26 from the reception of DCI trigger. If the report is received at slot 26 from the reception of DCI trigger, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   - R2:   the L1-SINR value of CSI-RS#1 reported by the UE is compared to the expected L1-SINR value for CSI-RS #1. If the resulting value is outside the limits in Table 7.6.6.1.5-2 or the UE fails to report the measurement value for CSI-RS #1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

   -R3:   The DIFF SINR value of CSI-RS #0 reported by the UE is compared to the expected DIFF SINR value. If the resulting value is outside the limits in Table 7.6.6.1.5-3 or the UE fails to report the measurement value for CSI-RS #0, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

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

7. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.), or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure

parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

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

7.6.6.1.4.3 Message contents

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

Table 7.6.6.1.4.3-1: Common Exception messages for FR2 CSI-RS based CMR and no dedicated IMR L1-SINR measurement in non-DRX

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.6A-1 with conditions APERIODIC and CSI-SINR Table H.3.6A-2 with conditions CSI-RS and APERIODIC

Table 7.6.6.1.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSBs.	
}			
}			

7.6.6.1.5 Test requirement

Table 7.6.6.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.6.1.5-1: CSI-RS specific test parameters for NR SA FR2 CSI-RS-based L1-SINR measurement in non-DRX

Parameter	Config	Unit	CSI-RS#0	CSI-RS#1
Angle of arrival configuration	1		Setup 1 according to A.3.15.1	
Beam assumption^Note 3	1		Rough	
N_{oc} ^Note1	1	dBm/15kHz	-105	
N_{oc} ^Note1	1	dBm/SSB SCS	-95.97	
$\hat{E}_s / I_{ot}$	1	dB	0	9
CSI-RS RSRP ^Note3	1	dBm/SSB SCS	-95.97	-86.97
Io ^Note2	1	dBm/95.04MHz	-63.97	-57.47
$\hat{E}_s / N_{oc}$	1	dB	0	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_{oc} to be fulfilled.				
Note 2: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.				
Note 3: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation				

After 160ms from the beginning of the test, the UE shall send L1-SINR report at slot 26 from the reception of DCI triggering the L1-SINR measurement. The L1-SINR report shall include the results for both CSI-RS#0 and CSI-RS#1. Each L1-SINR measurement report shall meet the corresponding absolute accuracy requirements in Table 7.6.6.1.5-2 the corresponding relative accuracy requirements in Table 7.6.6.1.5-3.

Table 7.6.6.1.5-2: L1-SINR absolute accuracy requirements for the reported values

Normal Conditions	T1
Lowest reported value (CSI-RS#1)	51
Highest reported value (CSI-RS#1)	74

Table 7.6.6.1.5-3: L1-SINR relative accuracy requirements for the reported values

	T1
Lowest DIFF SINR reported (CSI-RS#0)	4
Highest DIFF SINR reported (CSI-RS#0)	13

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

NOTE: The actual overall delays measured in the test may be up to 2xTTI_DCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

7.6.6.2 NR SA FR2 SSB based CMR and dedicated IMR L1-SINR measurement in DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test case is incomplete for extreme conditions

7.6.6.2.1 Test purpose

To verify that the UE makes correct reporting of L1-SINR measurement in DRX within L1-SINR measurement requirements in TS 38.133 [6] clause 9.8.4.2.

7.6.6.2.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards, supporting long DRX cycle and L1-SINR measurement.

7.6.6.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.6.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.6.2.

7.6.6.2.4 Test description

7.6.6.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.6.2.4.1-1.

Table 7.6.6.2.4.1-1: Applicable NR configurations for FR2 SSB based CMR and CSI-IM based IMR L1-SINR measurement

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

Table 7.6.6.2.4.1-2: General test parameters for FR2 SSB based CMR and CSI-IM based IMR L1-SINR measurement

Parameter	Config	Unit	Value
SSB GSCN	1~2		freq1
Duplex mode	1~2		TDD
TDD Configuration	1~2		TDDConf.3.1
BW$_{channel}$	1~2	MHz	100: $N_{RB,c}$ = 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

CSI-IM configuration	1~2			CSI-IM.3.1 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			periodic
reportQuantity-r16	1~2			ssb-Index-SINR-r16
Number of reported RS	1~2			2
L1-SINR reporting period	1~2	slot		640
T1	1~2	s		5
T2	1~2	s		2
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[Note 1]				
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.				

Table 7.6.6.2.4-3: Test Environment parameters for FR2 SSB based CMR and CSI-IM based IMR L1-SINR measurement

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 7.6.6.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1-1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram			

1. Message contents are defined in clause 7.6.6.2.4.3.

2. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I.

7.6.6.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 7.6.6.2.4.1-2. Before the test, UE is configured to perform RLM, BFD and L1-SINR measurement based on the SSBs.

1. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On,* according to TS 38.508-1 [14] clause 4.5 and general test parameters set according to Table 6.6.4.1.4.1-2.

2. Set the parameters according to T1 in Table 7.6.6.2.5-1. T1 starts.

3. The UE shall be transmitting CSI on PUCCH with a periodicity of 640 slots.

4. When T1 expires, the SS shall set the parameters according to T2 in 7.6.6.2.5-1. T2 starts.

5. The UE shall start sending valid L1-SINR reports. The SS shall check the following requirements:

   - R1: the UE shall start to transmit valid L1-SINR reports no later than 2960ms for UE supporting power class 1 in configuration 1, no later than 2920ms for UE supporting power class 1 in configuration 2, no later than 2000ms for UE supporting power class other than 1 in configuration 1 and no later than 1960 ms for UE supporting power class other than 1 in configuration 2 from the beginning of time period T2. A valid report shall meet the absolute L1-SINR requirements for SSB#1 Table 7.6.6.2.5-2 for all test configurations. If the first valid report is received before the specified time, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   - R2: the UE shall transmit L1-SINR reports every 640 slots. If the reports are received accordingly, the number of passed iterations for R2 is increased by one. Otherwise, the number of failed iterations for R2 is increased by one.

   -R3: The L1-SINR value of SSB#1 reported by the UE is compared to the expected L1-SINR value for SSB#1. In all consecutive reports after the first valid value is received, if the resulting value is outside the corresponding absolute accuracy requirements in Table 7.6.6.2.5-2 for all test configurations, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

   -R4: The DIFF-SINR value of SSB#0 reported by the UE is compared to the expected DIFF-SINR value. In all consecutive reports after the first valid value is received, if the resulting value is outside the corresponding relative accuracy requirements in Table 7.6.6.2.5-3 for all test configurations, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

6. The SS waits until T2 expires.

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

8. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.),
   or:
   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

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

7.6.6.2.4.3 Message contents

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

Table 7.6.6.2.4.3-1: Common Exception messages for FR2 SSB based CMR and CSI-IM based IMR L1-SINR measurement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.6A-1 with conditions PERIODIC and SS-SINR and CSI-IM_IMR Table H.3.6A-2 with conditions SSB and PERIODIC Table H.3.6A-4 with condition PERIODIC Table H.3.7-1 with condition DRX.3 Table H.3.4-1

Table 7.6.6.2.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSBs.	
detectionResource CHOICE {			
ssb-Index	0		
}			
}			
}			

7.6.6.2.5 Test requirement

Table 7.6.6.2.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.6.2.5-1: SSB specific test parameters for FR2 SSB based CMR and CSI-IM based IMR L1-SINR measurement

Parameter	Config	Unit	SSB#0		SSB#1	
			T1	T2	T1	T2
Angle of arrival configuration	1~2		Setup 1 according to A.3.15.1			
Beam assumption[Note 4]	1~2		Rough			
N_{oc} [Note2]	1~2	dBm/15kHz	-105			
N_{oc} [Note2]	1	dBm/SSB SCS	-96			
	2		-93			
$\hat{E}_s / I_{ot}$	1~2	dB	0	0	-Infinity	9
SSB RSRP [Note3]	1	dBm/SSB SCS	-96	-96	-Infinity	-87
	2		-93	-93	-Infinity	-84
Io [Note3]	1	dBm/95.04MHz	-64	-64	-67	-57.5
	2		-64	-64	-67	-57.5

$\hat{E}_s / N_{oc}$	1~2	dB	0	0	-Infinity	9

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:	SSB RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4:	Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

The UE shall send L1-SINR report every 640 slots. No later than X ms plus 640 slots from the beginning of time period T2, UE shall send L1-SINR report including the results for both SSB#0+CSI-IM#0 and SSB#1+CSI-IM#1 while meeting the accuracy requirements defined in clause 10.1.28.2, where X is

- 2880 for UE supporting power class 1

- 1920 for UE supporting power class 2,3 or 4.

Each L1-SINR measurement report shall meet the corresponding absolute accuracy requirements in Table 7.6.6.2.5-2 for all test configurations and the corresponding relative accuracy requirements in Table 7.6.6.2.5-3 for all test configurations.

Table 7.6.6.2.5-2: L1-SINR absolute accuracy requirements for the reported values for all test configurations

Normal Conditions	T1	T2
Lowest reported value (SSB#1)	-	53
Highest reported value (SSB#1)	-	72

Table 7.6.6.2.5-4: L1-SINR relative accuracy requirements for the reported values for all test configurations

	T1	T2
Lowest DIFF SINR reported (SSB#0)	-	5
Highest DIFF SINR reported (SSB#0)	-	12

For the test to pass, the ratio of successful reported valued for each requirement (R1 to R4) shall be at least 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

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.

7.6.6.3 NR SA FR2 CSI-RS based CMR and dedicated IMR L1-SINR measurement in DRX

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test case is incomplete for extreme conditions

7.6.6.3.1 Test purpose

To verify that the UE makes correct reporting of L1-SINR measurement in DRX within L1-SINR measurement requirements in TS 38.133 [6] clause 9.8.4.3.

7.6.6.3.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and supporting long DRX cycle and L1-SINR measurement.

7.6.6.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.6.6.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.7.6.6.3.

7.6.6.3.4 Test description

7.6.6.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.6.6.3.4.1-1.

Table 7.6.6.3.4.1-1: Applicable NR configurations for FR2 CSI-RS based CMR and CSI-RS based IMR L1-SINR measurement

Config	Description
1	LTE FDD, NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode
Note:	The UE is only required to be tested in one of the supported test configurations

Table 7.6.6.3.4.1-2: General test parameters for FR2 CSI-RS based CMR and CSI-RS based IMR L1-SINR measurement

Parameter	Config	Unit	Value
SSB GSCN	1		freq1
Duplex mode	1		TDD
TDD Configuration	1		TDDConf.3.1
BW$_{channel}$	1	MHz	100: N$_{RB,c}$ = 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 as CMR configuration	1		CSI-RS.3.3 TDD
CSI-RS as IMR configuration	1		CSI-RS.3.2A 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-r16	1		cri-SINR-r16
Number of reported RS	1		2
qcl-Info	1		SSB#0 for resource#0 SSB#1 for resource#1
reportSlotOffsetList	1		26
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	1	dB	0
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS$^{Note\ 1}$			
EPRE ratio of OCNG to OCNG DMRS $^{Note\ 1}$			
Propagation condition	1		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 7.6.6.3.4.1-3: Test Environment parameters for FR2 CSI-RS based CMR and CSI-RS based IMR L1-SINR measurement

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.2-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified by the test configuration selected from Table 7.6.6.3.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1-1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram			

1. Message contents are defined in clause 7.6.6.3.4.3.

2. The AoA setup for this test is Setup 1 as defined in clause A.9. The UE RX Beam Peak direction has been obtained previously using one of the search procedures as described in Annex I.

7.6.6.3.4.2   Test procedure

The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-SINR on aperiodic CSI-RS resources. Prior to the start of the time duration T1, the UE shall be fully synchronized to PCell. UE is also configured to measure L1-SINR based on SSB. Upon receiving the DCI trigger, UE provides the report back based on the reporting configuration as defined in table 7.6.6.3.4.1-2.

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

2. Set the parameters according to T1 in Table 7.6.6.3.5-1. T1 starts.

3. After 1440ms from the start of the test the SS transmits the DCI trigger in slot 8.

4. The SS shall check following requirements:

   - R1:   the UE shall send L1-SINR report at slot 26 from the reception of DCI trigger. If the report is received at slot 26 from the reception of DCI trigger, the number of passed iterations for R1 is increased by one. Otherwise, the number of failed iterations for R1 is increased by one.

   - R2:   the L1-SINR value of CSI-RS#1 reported by the UE is compared to the expected L1-SINR value for CSI-RS #1. If the resulting value is outside the limits in Table 7.6.6.3.5-2 or the UE fails to report the measurement value for CSI-RS #1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

   -R3:   The DIFF SINR value of CSI-RS #0 reported by the UE is compared to the expected DIFF SINR value. If the resulting value is outside the limits in Table 7.6.6.3.5-3 or the UE fails to report the measurement value for CSI-RS #0, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

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

7. After the RRC connection release, the SS:

   - transmits in Cell 1 a *Paging* message (including PagingRecord with ue-Identity) for the UE and ensures the UE in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.), or:

   - switches off and on the UE and ensures the UE is in state RRC_CONNECTED with generic procedure

parameters Connectivity NR SA, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

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

7.6.6.3.4.3 Message contents

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

Table 7.6.6.3.4.3-1: Common Exception messages for FR2 CSI-RS based CMR and CSI-RS based IMR L1-SINR measurement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.6A-1 with conditions APERIODIC and CSI-SINR and CSI-RS_IMR Table H.3.6A-2 with conditions CSI-RS and APERIODIC Table H.3.6A-3 with conditions APERIODIC Table H.3.7-1 with condition DRX.3 Table H.3.4-1

Table 7.6.6.3.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSBs.	
}			
}			

7.6.6.3.5 Test requirement

Table 7.6.6.3.5-1 defines the primary level settings including test tolerances for all tests.

Table 7.6.6.3.5-1: CSI-RS specific test parameters for NR SA FR2 CSI-RS-based CMR and CSI-RS based IMR L1-SINR measurement

Parameter	Config	Unit	CSI-RS#0	CSI-RS#1
Angle of arrival configuration	1~2		Setup 1 according to A.3.15.1	
Assumption for UE beams[Note 3]	1~2		Rough	
N_{oc} [Note1]	1~2	dBm/15kHz	-105	
N_{oc} [Note1]	1~2	dBm/SSB SCS	-95.97	
$\hat{E}_s/I_{ot}$	1~2	dB	1.5	9
CSI-RS RSRP [Note2]	1~2	dBm/SSB SCS	-94.5	-87.0
Io [Note2]	1~2	dBm/95.04MHz	-63.2	-57.5
$\hat{E}_s/N_{oc}$	1~2	dB	1.5	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_{oc} to be fulfilled.				
Note 2: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.				
Note 3: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation				

After 1440ms from the beginning of the test, the UE shall send L1-SINR report at slot 26 from the reception of DCI triggering the L1-SINR measurement. The L1-SINR report shall include the results for both CSI-RS#0 as CMR + CSI-RS#0 as IMR and CSI-RS#1 as CMR + CSI-RS#1 as IMR. Each L1-SINR measurement report shall meet the corresponding absolute accuracy requirements in Table 7.6.6.3.5-2 the corresponding relative accuracy requirements in Table 7.6.6.3.5-3.

Table 7.6.6.3.5-2: L1-SINR absolute accuracy requirements for the reported values

Normal Conditions	T1
Lowest reported value (CSI-RS#1)	54
Highest reported value (CSI-RS#1)	71

Table 7.6.6.3.5-3: L1-SINR relative accuracy requirements for the reported values

	T1
Lowest DIFF SINR reported (CSI-RS#0)	4
Highest DIFF SINR reported (CSI-RS#0)	10

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

NOTE: The actual overall delays measured in the test may be up to 2xTTI$_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

7.7 Measurement performance requirements

7.7.1 SS-RSRP

7.7.1.0 Minimum conformance requirements

7.7.1.0.1 Intra-frequency SS-RSRP measurement accuracy requirements

Same as in clause 5.7.1.0.1.

7.7.1.0.2 Inter-frequency SS-RSRP measurement accuracy requirements

Same as in clause 5.7.1.0.2.

7.7.1.1 NR SA FR2 SS-RSRP measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

7.7.1.1.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-RSRP measurement accuracy is within the specified limits for all bands.

7.7.1.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.7.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.1.1.

7.7.1.1.4 Test description

Two cells are configured in this test: Cell 1 is the NR FR2 serving cell and Cell 2 is the NR FR2 neighbour cell.

7.7.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.1.1.4.1-1.

Table 7.7.1.1.4.1-1: Supported test configurations

Configuration	Description
7.7.1.1-1	NR 120 kHz SSB SCS, 100 MHz bandwidth, FDD duplex mode
Note:	The UE is only required to be tested in one of the supported test configurations

Configure the test equipment and the DUT according to the parameters in Table 7.7.1.1.4.1-2.

Table 7.7.1.1.4.1-2: Initial conditions

Parameter	Value	Comment
Test environment	NC	As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1.	
Channel bandwidth	As specified by the selected test configuration.	
Propagation conditions	AWGN	As specified in Annex C.2.1
Connection Diagram	TE Part: A.3.3.1.1 DUT Part: A.3.4.1.1	As specified in TS 38.508-1 [14] Annex A.
Exceptions to connection diagram	N/A	

1. The general test parameter settings are set up according to Table 7.7.1.1.4.1-3.

2. Message contents are defined in clause 7.7.1.1.4.3.

3. There are two intra-frequency cells specified in the test, where Cell 1 is the NR FR2 serving cell and Cell 2 is the neighbour cell on the same NR FR2 carrier and the target cell for the SS-RSRP measurements.

4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

7.7.1.1.4.2   Test procedure

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

2. Set the parameters according to Table 7.7.1.1.5-1 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1.

4. The UE shall transmit an RRCReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the SS-RSRP reported values in the periodic MeasurementReport for the following requirements:

   - R1: The SS-RSRP value of Cell 1 reported by the UE is compared to the expected SS-RSRP for Cell 1. If the value is outside the limits in Table 7.7.1.1.5-3 or the UE fails to report the measurement value for Cell 1, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R1 is increased by one.

   - R2: The SS-RSRP value of Cell 2 reported by the UE is compared to the expected SS-RSRP for Cell 2. If the value is outside the limits in Table 7.7.1.1.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

   - R3: The SS-RSRP value of Cell 2 reported by the UE is compared to the reported SS-RSRP of Cell 1. If the resulting value is outside the limits in Table 7.7.1.1.5-4 or the UE fails to report the measurement value for Cell 1 or Cell 2, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G for each of the requirements is achieved. The evaluation of a specific requirement is concluded when the confidence level for that requirement is reached, even if more measurement reports are required for the remaining requirements.

8. Set the parameters according to Test 2 in Table 7.7.1.1.5-2 as appropriate and repeat steps 5-7. In Step 6, the SS shall check the following requirements:

   - R4: The SS-RSRP value of Cell 1 reported by the UE is compared to the expected SS-RSRP for Cell 1. If the value is outside the limits in Table 7.7.1.1.5-3 or the UE fails to report the measurement value for Cell 1, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

   - R5: The SS-RSRP value of Cell 2 reported by the UE is compared to the expected SS-RSRP for Cell 2. If the value is outside the limits in Table 7.7.1.1.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R5 is increased by one. Otherwise, the number of passed iterations for R5 is increased by one.

   - R6: The SS-RSRP value of Cell 2 reported by the UE is compared to the reported SS-RSRP of Cell 1. If the resulting value is outside the limits in Table 7.7.1.1.5-4 or the UE fails to report the measurement value for Cell 1 or Cell 2, the number of failed iterations for R6 is increased by one. Otherwise, the number of passed iterations for R6 is increased by one.

   - R7: The SS-RSRP value of Cell 1 reported by the UE during Test 2 is compared to the reported SS-RSRP of Cell 1 during Test 1 for the same iteration. If the resulting value is outside the limits in Table 7.7.1.1.5-5 or the UE fails to report the measurement value for Cell 1, the number of failed iterations for R7 is increased by one. Otherwise, the number of passed iterations for R7 is increased by one

   - R8: The SS-RSRP value of Cell 2 reported by the UE during Test 2 is compared to the reported SS-RSRP of Cell 2 during Test 1 for the same iteration. If the resulting value is outside the limits in Table 7.7.1.1.5-5 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R8 is increased by one. Otherwise, the number of passed iterations for R8 is increased by one

9. If more measurement reports with Test 1 configuration are needed in order to complete the evaluation R7 or R8, the SS shall set the parameters according to Table 7.7.1.1.5-2 as appropriate and repeat steps 5 to 8, evaluating R7 and / or R8 as appropriate.

7.7.1.1.4.3   Message contents

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

Table 7.7.1.1.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.1-3 with Condition Synchronous cells Table H.3.1-5 Table H.3.1-7 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 7.7.1.1.4.3-2: ReportConfigNR-DEFAULT(Periodical)

Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL			
Information Element	Value/remark	Comment	Condition
ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
periodical SEQUENCE {			PERIODICAL
reportQuantityCell SEQUENCE {			
rsrq	false		
sinr	false		
}			
maxReportCells	2		
}			
}			
}			

7.7.1.1.5   Test requirement

Table 7.7.1.1.5-1 defines the cell specific settings for all tests. Table 7.7.1.1.5-2 defines the OTA primary level settings including test tolerances for all tests.

The SS-RSRP measurement accuracy shall fulfil the absolute accuracy requirements in clause 7.7.1.0.1.1 and relative accuracy requirements in clause 7.7.1.0.1.2. The following eight requirements are to be verified:

During T1:

R1: Absolute accuracy of Cell 1. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table 7.7.1.1.5-3 and Table 7.7.1.1.5-3a.

R2: 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 7.7.1.1.5-3 and Table 7.7.1.1.5-3a.

R3: 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 7.7.1.1.5-4.

During T2:

R4: Absolute accuracy of Cell 1. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in table 7.7.1.1.5-3 and Table 7.7.1.1.5-3a.

R5: 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 7.7.1.1.5-3 and Table 7.7.1.1.5-3a..

R6: 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 7.7.1.1.5-4.

During T1 and T2:

R7: 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 7.7.1.1.5-5.

R8: 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 7.7.1.1.5-5.

Table 7.7.1.1.5-1: SS-RSRP Intra frequency general test parameters

Parameter[Note 5]	Unit	T1		T2	
		Cell 1	Cell 2	Cell 1	Cell 2
Physical cell ID		489	0	489	0

SSB ARFCN			freq1		freq1
Duplex mode			TDD		TDD
TDD configuration			TDDConf.3.1		TDDConf.3.1
$BW_{channel}$	MHz		100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66
Data RBs allocated			24		24
Downlink initial BWP configuration			DLBWP.0.1	-	DLBWP.0.1	-
Downlink dedicated BWP configuration			DLBWP.1.1	-	DLBWP.1.1	-
Uplink initial BWP configuration			ULBWP.0.1	-	ULBWP.0.1	-
Uplink dedicated BWP configuration			ULBWP.1.1	-	ULBWP.1.1	-
DRX cycle configuration			Not applicable	-	Not applicable	-
TRS configuration			TRS.2.1 TDD	-	TRS.2.1 TDD	-
TCI state			TCI.State.0	-	TCI.State.0	-
PDSCH Reference measurement channel			SR.3.2 TDD	-	SR.3.2 TDD	-
RMSI CORESET Reference Channel			CR.3.1 TDD	-	CR.3.1 TDD	-
Dedicated CORESET Reference Channel			CCR.3.1 TDD	-	CCR.3.1 TDD	-
OCNG Patterns			OP.3	OP.3	OP.3	OP.3
SSB configuration			SSB.3 FR2	SSB.3 FR2	SSB.3 FR2	SSB.3 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 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 SSS[Note 1]						
EPRE ratio of OCNG to OCNG DMRS [Note 1]						
Propagation conditions			AWGN	AWGN	AWGN	AWGN
Antenna configuration			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 Note 3: Void Note 4: Void Note 5: All parameters apply for configuration 1 and 2 Note 6: Void						

Table 7.7.1.1.5-2: SS-RSRP Intra frequency OTA related test parameters

Parameter	Unit	T1		T2	
		Cell 1	Cell 2	Cell 1	Cell 2
Angle of arrival configuration		Setup 1			
Assumption for UE beams[Note 8]		Rough			
N_{oc} [Note1]	dBm/15kHz[Note4]	-97.4		N/A	
N_{oc} [Note1]	dBm/SCS [Note4]	-88.37		N/A	
$\hat{E}_s/N_{oc}$	dB	6.0	1.4	N/A	N/A
Es	dBm/SCS [Note4]			(Table B.2.2-2 Rx Beam Peak +9.8dB)	(Table B.2.2-2 Rx Beam Peak +9.8dB)
SSB_RP[Note2]	dBm/SCS	-82.37	-86.97	(Table B.2.2-2 Rx Beam Peak +9.8dB)	(Table B.2.2-2 Rx Beam Peak +9.8dB)
$\hat{E}_s/I_{ot\ BB}$ [Note6]	dB	2.20	-5.59	-1.77	-1.77
Io[Note2]	dBm/95.04 MHz [Note4]	-55.74		(Table B.2.2-2 Rx Beam Peak +37.40dB)	
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/Iot and Io 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/Iot_BB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1dB for UE multi-band relaxation factor ΔMB_P from TS 38.101-2 [3] Table 6.2.1.3-4.				
Note 7:	All parameters apply for configurations 1 and 2				
Note 8:	Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6], and does not limit UE implementation or test system implementation				

Table 7.7.1.1.5-3: evaluation limits for the reported values for T1 and T2 absolute accuracy rules R1, R2, R4, R5

UE power class 3			
Normal Conditions	**Test 1 All bands**	**Test 2**	
Lowest reported value (Cell 1)	50	n257, n258, n261	31
		n260	33
		n259	FFS
Highest reported value (Cell 1)	108	n257, n258, n261	88
		n260	90
		n259	FFS
Lowest reported value (Cell 2)	46	n257, n258, n261	31
		n260	33
		n259	FFS
Highest reported value (Cell 2)	103	n257, n258, n261	88
		n260	90
		n259	FFS
Extreme Conditions	**Test 1 All bands**	**Test 2**	
Lowest reported value (Cell 1)	47+ FFS	n257, n258, n261	28 + FFS
		n260	30 + FFS
		n259	FFS
Highest reported value (Cell 1)	111+ FFS	n257, n258, n261	91 + FFS
		n260	93 + FFS
		n259	FFS
Lowest reported value (Cell 2)	46+ FFS	n257, n258, n261	28+ FFS
		n260	30+ FFS
		n259	FFS
Highest reported value (Cell 2)	106+ FFS	n257, n258, n261	91+ FFS
		n260	93+ FFS
		n259	FFS

Table 7.7.1.1.5-3a: evaluation limits for the ∆(Max-Min) reported values for each cell during each time period

UE power class 3		
Normal Conditions	**Test 1 All bands**	**Test 2 All bands**
∆(Max-Min) reported value Cell 1	16	16
∆(Max-Min) reported value Cell 2	16	16
Extreme Conditions	**Test 1 All bands**	**Test 2 All bands**
∆(Max-Min) reported value Cell 1	16 + FFS	16+ FFS
∆(Max-Min) reported value Cell 2	16 + FFS	16 + FFS

Table 7.7.1.1.5-4: evaluation limits for the reported values for T1 and T2 relative accuracy rules R3, R6

UE power class 3		
Normal Conditions	**Test 1 All bands**	**Test 2 All bands**
Lowest reported value (Cell 2 – Cell 1)	- 12	- 6
Highest reported value (Cell 2 – Cell 1)	+ 2	+ 6
Extreme Conditions	**Test 1 All bands**	**Test 2 All bands**
Lowest reported value (Cell 2 – Cell 1)	- 15+ FFS	- 9+ FFS
Highest reported value (Cell 2 – Cell 1)	+ 5+ FFS	+ 9+ FFS

Table 7.7.1.1.5-5: evaluation limits for the reported values for T2 with respect to T1 relative accuracy rules R7, R8

UE power class 3			
Test 2	**Bands**	**Normal Conditions**	**Extreme Conditions**
Lowest reported value (Cell 1 T2 – Cell 1 T1)	n257, n258, n261	- 28	- 31+ FFS
	n260	- 26	- 29+ FFS
	n259	FFS	FFS
Highest reported value (Cell 1 T2 – Cell 2 T1)	n257, n258, n261	- 12	- 9+ FFS
	n260	- 10	- 7+ FFS
	n259	FFS	FFS
Lowest reported value (Cell 2 T2 – Cell 2 T1)	n257, n258, n261	- 24	- 27+ FFS
	n260	- 21	- 24+ FFS
	n259	FFS	FFS
Highest reported value (Cell 2 T2 – Cell 2 T1)	n257, n258, n261	- 8	- 5+ FFS
	n260	- 5	- 2+ FFS
	n259	FFS	FFS

For the test to pass, the ratio of successful reported values for each requirement (R1 to R8) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

7.7.1.2 NR SA FR2-FR2 SS-RSRP measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

7.7.1.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRP measurement accuracy is within the specified limits for all bands.

7.7.1.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.7.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.1.2.

7.7.1.2.4 Test description

Two cells are configured in this test: Cell 1 is the NR FR2 serving cell and Cell 2 is the inter-frequency NR FR2 neighbour cell.

7.7.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.1.2.4.1-1.

Table 7.7.1.2.4.1-1: Supported test configurations

Configuration	Description
7.7.1.2-1	NR 120 kHz SSB SCS, 100 MHz bandwidth, FDD duplex mode
7.7.1.2-2	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

Configure the test equipment and the DUT according to the parameters in Table 7.7.1.2.4.1-2.

Table 7.7.1.2.4.1-2: Initial conditions

Parameter	Value	Comment
Test environment	NC	As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1.	
Channel bandwidth	As specified by the selected test configuration.	
Propagation conditions	AWGN	As specified in Annex C.2.1
Connection Diagram	TE Part: A.3.3.1.1 DUT Part: A.3.4.1.1	As specified in TS 38.508-1 [14] Annex A.
Exceptions to connection diagram	N/A	

1. The general test parameter settings are set up according to Table 7.7.1.2.4.1-3.

2. Message contents are defined in clause 7.7.1.2.4.3.

3. There are two inter-frequency cells specified in the test, where Cell 1 is the serving cell on an NR FR2 carrier and Cell 2 is the neighbour cell on a different NR FR2 carrier and the target cell for the SS-RSRP measurements.

4. The rx beam peak and directions in which the UE meets the EIS spherical coverage criteria have been found with one of the procedures from Annex I.

7.7.1.2.4.2 Test procedure

1. Configure the positioning system for a valid test point as defined in A.9.4. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 7.7.1.2.5-1 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1.

4. The UE shall transmit an RRCReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the SS-RSRP reported values in the periodic MeasurementReport for the following requirements:

   - R1: The SS-RSRP value of Cell 1 reported by the UE is compared to the expected SS-RSRP for Cell 1. If the value is outside the limits in Table 7.7.1.2.5-3 or the UE fails to report the measurement value for Cell 1, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R1 is increased by one.

   - R2: The SS-RSRP value of Cell 2 reported by the UE is compared to the expected SS-RSRP for Cell 2. If the value is outside the limits in Table 7.7.1.2.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

   - R3: The SS-RSRP value of Cell 2 reported by the UE is compared to the reported SS-RSRP of Cell 1. If the resulting value is outside the limits in Table 7.7.1.2.5-4 or the UE fails to report the measurement value for Cell 1 or Cell 2, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G for each of the requirements is achieved. The evaluation of a specific requirement is concluded when the confidence level for that requirement is reached, even if more measurement reports are required for the remaining requirements.

8. The SS shall select a new test point as defined in A.9.4 and rotate the positioning system for the selected test point.

9. Set the parameters according to Test 2 in Table 7.7.2.1.5-2 as appropriate and repeat steps 5-7. In Step 6, the SS shall check the following requirements:

   - R4: The SS-RSRP value of Cell 1 reported by the UE is compared to the expected SS-RSRP for Cell 1. If the value is outside the limits in Table 7.7.2.1.5-3 or the UE fails to report the measurement value for Cell 1, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

   - R5: The SS-RSRP value of Cell 2 reported by the UE is compared to the expected SS-RSRP for Cell 2. If the value is outside the limits in Table 7.7.2.1.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R5 is increased by one. Otherwise, the number of passed iterations for R5 is increased by one.

   - R6: The SS-RSRP value of Cell 2 reported by the UE is compared to the reported SS-RSRP of Cell 1. If the resulting value is outside the limits in Table 7.7.2.1.5-4 or the UE fails to report the measurement value for Cell 1 or Cell 2, the number of failed iterations for R6 is increased by one. Otherwise, the number of passed iterations for R6 is increased by one.

7.7.1.2.4.3 Message contents

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

Table 7.7.1.2.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells Table H.3.1-5 Table H.3.1-6 with condition Pattern #0 Table H.3.1-7 with condition INTER-FREQ Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 7.7.1.2.4.3-2: ReportConfigNR-DEFAULT(Periodical)

Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
periodical SEQUENCE {			PERIODICAL
reportQuantityCell SEQUENCE {			
rsrq	false		
sinr	false		
}			
maxReportCells	2		
}			
}			
}			

7.7.1.2.5 Test requirement

Table 7.7.1.2.5-1 defines the cell specific settings for all tests. Table 7.7.1.2.5-2 defines the OTA primary level settings including test tolerances for all tests.

The SS-RSRP measurement accuracy shall fulfil the absolute accuracy requirements in clause 7.7.1.0.2.1 and relative accuracy requirements in clause 7.7.1.0.2.2. The following eight requirements are to be verified:

During T1:

R1: Absolute accuracy of Cell 1. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table 7.7.1.2.5-3 for test configuration 1 and in Table 7.7.1.2.5-4 for test configuration 2.

R2: 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 7.7.1.2.5-3 for test configuration 1 and in Table 7.7.1.2.5-4 for test configuration 2 and Table 7.7.1.2.5-3a [for both configurations].

R3: 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 7.7.1.2.5-5.

During T2:

R4: Absolute accuracy of Cell 1. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in table 7.7.1.2.5-3 for test configuration 1 and in Table 7.7.1.2.5-4 for test configuration 2.

R5: 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 7.7.1.2.5-3 for test configuration 1 and in Table 7.7.1.2.5-4 for test configuration 2 and Table 7.7.1.2.5-3a [for both configurations].

R6: 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 7.7.1.2.5-5.

Table 7.7.1.2.5-1: SS-RSRP Inter frequency general test parameters

Parameter	Config	Unit	Test 1		Test 2	
			Cell 1	**Cell 2**	**Cell 1**	**Cell 2**
SSB ARFCN	1~2		freq1	freq2	freq1	freq2
BW$_{channel}$	1~2		100: N$_{RB,c}$ = 66		100: N$_{RB,c}$ = 66	
Data RBs allocated	1		24		24	
	2		48		48	
Gap pattern ID			0		0	
Duplex mode	1~2		TDD		TDD	
TDD configuration	1~2		TDDConf.3.1		TDDConf.3.1	
PDSCH Reference measurement channel	1		SR.3. 2 TDD	-	SR.3. 2 TDD	-
	2		SR.3.3 TDD		SR.3.3 TDD	
RMSI CORESET Reference Channel	1		CR.3.1 TDD	-	CR.3.1 TDD	-
	2		CR.3.2 TDD		CR.3.2 TDD	
Dedicated CORESET Reference Channel	1		CCR.3.1 TDD	-	CCR.3.1 TDD	-
	2		CCR.3.7 TDD		CCR.3.7 TDD	
SSB configuration	1		SSB.3 FR2		SSB.3 FR2	
	2		SSB.4 FR2		SSB.4 FR2	
PDSCH/PDCCH subcarrier spacing	1~2	kHz	120		120	
OCNG Patterns	1~2		OP.3		OP.3	
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	
Time offset between Cell 2 and Cell 1	1~2	μs	3		3	
EPRE ratio of PSS to SSS	1~2	dB	0	0	0	0
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH DMRS						
EPRE ratio of OCNG DMRS to SSS$^{Note 1}$						
EPRE ratio of OCNG to OCNG DMRS $^{Note 1}$						
Propagation condition	1~2	-	AWGN	AWGN	AWGN	AWGN
Antenna configuration	1~2	-	1x2	1x2	1x2	1x2
Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.						
Note 2: Void.						

Table 7.7.1.2.5-2: SS-RSRP Inter frequency OTA related test parameters

Parameter	Config	Unit	Test 1		Test 2	
			Cell 1	Cell 2	Cell 1	Cell 2
Angle of arrival configuration	1~2		Setup 4b according to clause A.9.4		Setup 4b according to clause A.9.4	
			AoA1 Spherical coverage	AoA2 Rx Beam Peak	AoA1 Spherical coverage	AoA2 Rx Beam Peak
Assumption for UE beams[Note 7]	1~2		Rough		Rough	
N_{oc} [Note1]	1,	dBm/15kHz[Note4]	-96.3	-96.3	(Table B.2.3-2 Rx Beam Peak[Note 8] -4.63dB)	(Table B.2.3-2 Rx Beam Peak[Note 8] -3.03dB)
	2		-99.3	-99.3		
N_{oc} [Note1]	1	dBm/SCS [Note4]	-87.3	-87.3	(Table B.2.3-2 Rx Beam Peak[Note 8] +4.4dB)	(Table B.2.3-2 Rx Beam Peak[Note 8] +6.0dB)
	2		-87.3	-87.3	(Table B.2.3-2 Rx Beam Peak[Note 8] +7.4dB)	(Table B.2.3-2 Rx Beam Peak[Note 8] +9.0dB)
$\hat{E}_s / N_{oc}$	1~2	dB	6.0	6.0	17.0	1.0
SSB_RP[Note2]	1	dBm/SCS	-81.3	-81.3	(Table B.2.3-2 Rx Beam Peak[Note 8] +21.4dB)	(Table B.2.3-2 Rx Beam Peak[Note 8] +7.0dB)
	2		-81.3	-81.3	(Table B.2.3-2 Rx Beam Peak[Note 8] +24.4dB)	(Table B.2. 3-2 Rx Beam Peak[Note 8] +10.0dB)
($SSB\_RP_{Cell\ 1}$ − $SSB\_RP_{Cell\ 2}$)	1~2	dB	0		14.40	
$\hat{E}_s / I_{ot\ BB}$[Note6]	1	dB	5.23	5.93	5.38	-1.46
	2		4. 58	5.87		
Io[Note2]	1	dBm/95.04 MHz [Note4]	-55.70	-55.70	(Table B.2.3-2 Rx Beam Peak[Note 8] +46.08dB)	(Table B.2.3-2 Rx Beam Peak[Note 8] +35.13dB)
	2		-55.7	-55.7	(Table B.2.3-2 Rx Beam Peak[Note 8] +49.09dB)	(Table B.2.3-2 Rx Beam Peak[Note 8] +38.14dB)
($Io_{freq\ 1}$ − $Io_{freq\ 2}$)	1~2	dB	0		11.95	

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/Iot, Io, (SSB_RP$_{Cell\ 2}$ – SSB_RP$_{Cell\ 1}$) and (Io$_{freq\ 2}$ – 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/Iot$_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [3], and an allowance of 1dB for UE multi-band relaxation factor ΔMB$_P$ or ΔMB$_S$ from TS 38.101-2 [3] Table 6.2.1.3-4.
Note 7:	Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6], and does not limit UE implementation or test system implementation
Note 8:	The value in Table B.2.3-2 of TS 38.133 [6] is the Minimum SSB_RP for SCS$_{SSB}$ = 120 kHz, selected according to the operating band of Cell 2 and UE power class, without ΔMB$_{P,n}$ adjustment.

Table 7.7.1.2.5-3: evaluation limits for the reported values for T1 and T2 absolute accuracy rules R1, R2, R4, R5 for test configuration 1

UE power class 3				
Normal Conditions	**Test 1**		**Test 2**	
Lowest reported value (Cell 1)	n257, n258, n261	41	n257, n258, n261	33
	n260	39	n260	34
	n259	FFS	n259	FFS
Highest reported value (Cell 1)	All bands: 109		n257, n258, n261	101
			n260	104
			n259	FFS
Lowest reported value (Cell 2)	All bands: 52		n257, n258, n261	32
			n260	34
			n259	FFS
Highest reported value (Cell 2)	All bands: 109		n257, n258, n261	87
			n260	90
			n259	FFS
Extreme Conditions	**Test 1**		**Test 2**	
Lowest reported value (Cell 1)	n257, n258, n261	41 + FFS	n257, n258, n261	33 + FFS
	n260	39 + FFS	n260	34 + FFS
	n259	FFS	n259	FFS
Highest reported value (Cell 1)	All bands: 109 + FFS		n257, n258, n261	101 + FFS
			n260	104 + FFS
			n259	FFS
Lowest reported value (Cell 2)	All bands: 52 + FFS		n257, n258, n261	32+ FFS
			n260	34+ FFS
			n259	FFS
Highest reported value (Cell 2)	All bands: 109 + FFS		n257, n258, n261	87+ FFS
			n260	90+ FFS
			n259	FFS

Table 7.7.1.2.5-3a: evaluation limits for the Δ(Max-Min) reported absolute values for cell 2 during each time period

	Test 1 All bands	Test 2 All bands
Normal Conditions		
Δ(Max-Min) reported value Cell 2	16	16
Extreme Conditions		
Δ(Max-Min) reported value Cell 2	16 + FFS	16 + FFS

Table 7.7.1.2.5-4: evaluation limits for the reported values for T1 and T2 absolute accuracy rules R1, R2, R4, R5 for test configuration 2

UE power class 3				
Normal Conditions	**Test 1**		**Test 2**	
Lowest reported value (Cell 1)	n257, n258, n261	41	n257, n258, n261	36
	n260	39	n260	37
	n259	FFS	n259	FFS
Highest reported value (Cell 1)	All bands: 109		n257, n258, n261	104
			n260	107
			n259	FFS
Lowest reported value (Cell 2)	All bands: 52		n257, n258, n261	35
			n260	37
			n259	FFS
Highest reported value (Cell 2)	All bands: 109		n257, n258, n261	90
			n260	93
			n259	FFS
Extreme Conditions	**Test 1**		**Test 2**	
Lowest reported value (Cell 1)	n257, n258, n261	41 + FFS	n257, n258, n261	36 + FFS
	n260	39 + FFS	n260	37 + FFS
	n259	FFS	n259	FFS
Highest reported value (Cell 1)	All bands: 109 + FFS		n257, n258, n261	104 + FFS
			n260	107 + FFS
			n259	FFS
Lowest reported value (Cell 2)	All bands: 52 + FFS		n257, n258, n261	35+ FFS
			n260	37+ FFS
			n259	FFS
Highest reported value (Cell 2)	All bands: 109 + FFS		n257, n258, n261	90+ FFS
			n260	93+ FFS
			n259	FFS

Table 7.7.1.2.5-5: evaluation limits for the reported values for T1 and T2 relative accuracy rules R3, R6

UE power class 3				
Normal Conditions	**Test 1**		**Test 2 All bands**	
Lowest value (RSRP report Cell 2 – RSRP report Cell 1)	All bands: -15		-29	
Highest value (RSRP report Cell 2 – RSRP report Cell 1)	n257, n258, n261	+25	n257, n258, n261	+11
	n260	+27	n260	+13
	n259	FFS	n259	FFS
Extreme Conditions	**Test 1**		**Test 2 All bands**	
Lowest value (RSRP report Cell 2 – RSRP report Cell 1)	-15 + FFS		-29+ FFS	
Highest value (RSRP report Cell 2 – RSRP report Cell 1)	n257, n258, n261	+25 + FFS	n257, n258, n261	+11 + FFS
	n260	+27+ FFS	n260	+13 + FFS
	n259	FFS	n259	FFS

For the test to pass, the ratio of successful reported values for each requirement (R1 to R6) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

7.7.1.3 Inter-frequency measurements between FR1 and FR2

7.7.1.3.1 NR SA FR1-FR2 SS-RSRP measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

7.7.1.3.1.1   Test Purpose

The purpose of this test is to verify that the inter-frequency SS-RSRP absolute measurement accuracy with FR1 serving cell and FR2 target cell.

7.7.1.3.1.2   Test applicability

This test applies to all types of NR UE release 15 onwards.

7.7.1.3.1.3   Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.1.3.

7.7.1.3.1.4   Test description

7.7.1.3.1.4.1   Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.1.3.1.4.1-1.

Table 7.7.1.3.1.4.1-1: Applicable NR configurations for FR1 inter-frequency SS-RSRP accuracy test

Config	Description of serving cell	Description of target cell
7.7.1.3.1-1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	
7.7.1.3.1-2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode
7.7.1.3.1-3	NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	

Configure the test equipment and the DUT according to the parameters in Table 7.7.1.3.1.4.1-2.

Table 7.7.1.3.1.4.1-2: Initial conditions for NR SA FR1-FR2 SS-RSRP absolute measurement accuracy

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.7.1.3.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 7.7.1.3.1.4.3.

2. Cell 1 is the NR FR1 serving cell (PCell) and Cell 2 is the NR FR2 neighbour cell (the target cell for SS-RSRP measurements) on a different frequency than the PCell. The connection setup is done according to the settings in Annex C.1.1 and C.1.2.

3. The directions in which the UE meets the EIS spherical coverage criteria have been found with one of the procedures from Annex I.

7.7.1.3.1.4.2   Test procedure

1. Configure the positioning system for a valid test point as defined in A.9.2. Ensure the UE is in state RRC_CONNECTED with generic procedure parameters *Connectivity* NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters according to Table 7.7.1.3.5-1 as appropriate.

3. The SS shall transmit an *RRCConnectionReconfiguration* message on Cell 1.

4. The UE shall transmit an *RRCConnectionReconfigurationComplete* message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the SS-RSRP reported values in the periodic MeasurementReport for the following requirements:

   - R1: The SS-RSRP value of Cell 2 reported by the UE is compared to the expected SS-RSRP for Cell 2. If the value is outside the limits in Table 7.7.1.3.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R1 is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G for each of the requirements is achieved. The evaluation of a specific requirement is concluded when the confidence level for that requirement is reached, even if more measurement reports are required for the remaining requirements.

8. The SS shall select a new test point as defined in A.9.2 and rotate the positioning system for the selected test point.

9. Set the parameters according to Test 2 in Table 7.7.1.3.5-2 as appropriate and repeat steps 5-7. In Step 6, the SS shall check the following requirements:

   - R2: The SS-RSRP value of Cell 2 reported by the UE is compared to the expected SS-RSRP for Cell 2. If the value is outside the limits in Table 7.7.1.3.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

7.7.1.3.1.4.3   Message contents

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

Table 7.7.1.3.1.4.3-1: Common Exception messages for NR SA FR1-FR2 SS-RSRP absolute measurement accuracy

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTER-FREQ and GAP NEEDED Table H.3.1-3 with Condition SSB.1 FR1 and Synchronous cells Table H.3.1-5 Table H.3.1-6 with condition Pattern #0 Table H.3.1-7 with Condition INTER-FREQ Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 7.7.1.3.1.4.3-2: ReportConfigNR-DEFAULT

Derivation Path: TS 38.508-1 [14] Table 4.6.3-142 with Condition PERIODICAL			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
periodical SEQUENCE {			PERIODICAL
reportQuantityCell SEQUENCE {			

rsrq	false		
sinr	false		
}			
maxReportCells	2		
}			
}			
}			

7.7.1.3.1.5   Test requirement

Table 7.7.1.3.1.5-1 and Table 7.7.1.3.1.5-2 define the primary level settings including test tolerances for all tests.

Each SS-RSRP measurement report for each of the tests in Table 7.7.1.3.1.5-1 and 7.7.1.3.1.5-2 shall meet the corresponding absolute accuracy requirements in Table 7.7.1.3.1.5-3.

Table 7.7.1.3.1.5-1: SS-RSRP inter-frequency test parameters

Parameter	Config	Unit	Test 1		Test 2	
			Cell 1	**Cell 2**	**Cell 1**	**Cell 2**
SSB ARFCN	1~3		freq1	freq2	freq1	freq2
BW$_{channel}$	1	MHz	10: $N_{RB,c} = 52$	100: $N_{RB,c} = 66$	10: $N_{RB,c} = 52$	100: $N_{RB,c} = 66$
	2		10: $N_{RB,c} = 52$		10: $N_{RB,c} = 52$	
	3		40: $N_{RB,c} = 106$		40: $N_{RB,c} = 106$	
Duplex mode	1		FDD	TDD	FDD	TDD
	2		TDD		TDD	
	3		TDD		TDD	
TDD configuration	1		N/A	TDDConf. 3.1	N/A	TDDConf. 3.1
	2		TDDConf. 1.1		TDDConf. 1.1	
	3		TDDConf. 2.1		TDDConf. 2.1	
PDSCH Reference measurement channel	1		SR.1.1 FDD	-	SR.1.1 FDD	-
	2		SR.1.1 TDD		SR.1.1 TDD	
	3		SR.2.1 FDD		SR.2.1 FDD	
RMSI CORESET Reference Channel	1		CR.1.1 FDD	-	CR.1.1 FDD	-
	2		CR.1.1 TDD	-	CR.1.1 TDD	-
	3		CR.2.1 FDD	-	CR.2.1 FDD	-
Dedicated CORESET Reference Channel	1		CCR.1.1 FDD	-	CCR.1.1 FDD	-
	2		CCR.1.1 TDD	-	CCR.1.1 TDD	-
	3		CCR.2.1 TDD	-	CCR.2.1 TDD	-
SSB configuration	1		SSB.1 FR1	SSB.1 FR2	SSB.1 FR1	SSB.1 FR2
	2		SSB.1 FR1		SSB.1 FR1	
	3		SSB.2 FR1		SSB.2 FR1	
OCNG Patterns	1~3		OP.1		OP.1	
Initial BWP Configuration	1~3		DLBWP.0.1 ULBWP.0.1		DLBWP.0.1 ULBWP.0.1	
Dedicated BWP configuration	1~3		DLBWP.1.3 ULBWP.1.3		DLBWP.1.3 ULBWP.1.3	
TRS Configuration	1~3		TRS.2.1 TDD		TRS.2.1 TDD	
PDCCH/PDSCH TCI Configuration	1~3		TCI.State.2		TCI.State.2	
SMTC configuration	1~3		SMTC.1		SMTC.1	
Time offset between Cell 1 and Cell 2	1~3	μs	3		3	
EPRE ratio of PSS to SSS	1~3	dB	0	0	0	0
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH DMRS						
EPRE ratio of OCNG DMRS to SSS[Note 1]						
EPRE ratio of OCNG to OCNG DMRS [Note 1]						
Propagation condition	1~3	-	NA	AWGN	NA	AWGN
Antenna configuration	1~3	-	Link only, see TS 38.133 [6] clause A.3.7A	1x2	Link only, see TS 38.133 [6] clause A.3.7A	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.

Table 7.7.1.3.5-2: SS-RSRP inter-frequency OTA related test parameters

Parameter	Config	Unit	Test 1		Test 2 NOTE 3	
			Cell 1	Cell 2	Cell 1	Cell 2
Angle of arrival configuration according to clause A.9			NA	Setup 2b	NA	Setup 2b
Assumption for UE beams Note 4			N/A	Rough	N/A	Rough
N_{oc}	1~6	dBm/15 kHz		-95.5		NA
N_{oc}	1~6	dBm/SSB SCS		-86.47		NA
$\hat{E}_s/N_{oc}$	1~6	dB		5		NA
E_s	1~6	dBm/SCS	NA Link only, see clause A.3.7A of TS 38.133 [6]	NA	NA Link only, see clause A.3.7A of TS 38.133 [6]	(Table B.2.3-2 Spherical coverage +6.5dB)
SSB_RP Note1	1~6	dBm/SCS		-81.47		(Table B.2.3-2 Spherical coverage +6.5dB)
$\hat{E}_s/I_{0t\ BB}$ Note6	1~6	dB		4.35		1.69
Io Note1	1~6	dBm/95.04MHz		-55.68		SSB_RP+34.48
Note 1:	Es/Iot, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.					
Note 2:	Void					
Note 3:	No additional noise is added by the test system in Test 2.					
Note 4:	Information about types of UE beam is given in B.2.1.3, of TS 38.133 [6] and does not limit UE implementation or test system implementation.					
Note 5:	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 6:	Calculation of Es/Iot_BB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [2], and an allowance of 1dB for UE multi-band relaxation factor ΔMB_S from TS 38.101-2 [2] Table 6.2.1.3-4.					

Table 7.7.1.3.5-3: evaluation limits for the reported values for Test 1 and Test 2 absolute accuracy rules R1, R2

UE power class 3				
Normal Conditions	Test 1		Test 2	
Lowest reported value (Cell 2)	n257, n258, n261	46	n257, n258, n261	46
	n260	45	n260	47
	n259	FFS	n259	FFS

Highest reported value (Cell 2)	n257, n258, n261	103	n257, n258, n261	101
	n260	102	n260	104
	n259	FFS	n259	FFS
Extreme Conditions	**Test 1**		**Test 2**	
Lowest reported value (Cell 2)	n257, n258, n261	FFS	n257, n258, n261	FFS
	n260	FFS	n260	FFS
	n259	FFS	n259	FFS
Highest reported value (Cell 2)	n257, n258, n261	FFS	n257, n258, n261	FFS
	n260	FFS	n260	FFS
	n259	FFS	n259	FFS

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

7.7.1.3.2 Void

7.7.2 SS-RSRQ

7.7.2.0 Minimum conformance requirements

7.7.2.0.1 Intra-frequency SS-RSRQ measurement accuracy requirements

Same as in clause 5.7.2.0.1.

7.7.2.0.2 Inter-frequency SS-RSRQ measurement accuracy requirements

Same as in clause 5.7.2.0.2.

7.7.2.1 NR SA FR2 SS-RSRQ measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

7.7.2.1.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-RSRQ measurement accuracy is within the specified limits for all bands.

7.7.2.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.7.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.2.1.

7.7.2.1.4 Test description

Two cells are configured in this test: Cell 1 is the NR FR2 serving cell and Cell 2 is the intra-frequency NR FR2 neighbour cell.

7.7.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.2.1.4.1-1.

Table 7.7.2.1.4.1-1: Supported test configurations

Configuration	Description
7.7.2.1-1	NR 120 kHz SSB SCS, 100 MHz bandwidth, FDD duplex mode
Note:	The UE is only required to be tested in one of the supported test configurations

Configure the test equipment and the DUT according to the parameters in Table 7.7.2.1.4.1-2.

Table 7.7.2.1.4.1-2: Initial conditions

Parameter	Value	Comment
Test environment	NC	As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1.	
Channel bandwidth	As specified by the selected test configuration.	
Propagation conditions	AWGN	As specified in Annex C.2.1
Connection Diagram	TE Part: A.3.3.1.1 DUT Part: A.3.4.1.1	As specified in TS 38.508-1 [14] Annex A.
Exceptions to connection diagram	N/A	

1. The general test parameter settings are set up according to Table 7.7.2.1.4.1-3.

2. Message contents are defined in clause 7.7.2.1.4.3.

3. There are two intra-frequency cells specified in the test, where Cell 1 is the NR FR2 serving cell and Cell 2 is the neighbour cell on the same NR FR2 carrier and the target cell for the SS-RSRQ measurements.

4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

7.7.2.1.4.2 Test procedure

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

2. Set the parameters according to Table 7.7.2.1.5-1 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1.

4. The UE shall transmit an RRCReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the SS-RSRQ reported values in the periodic MeasurementReport. The SS-RSRQ value of Cell 2 reported by the UE is compared to the expected SS-RSRQ. If the value is outside the limits in Table 7.7.2.1.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 7.7.2.1.5-2 as appropriate and repeat steps 5-7.

7.7.2.1.4.3 Message contents

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

Table 7.7.2.1.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.1-3 with Condition Synchronous cells Table H.3.1-5 Table H.3.1-7 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 7.7.2.1.4.3-2: ReportConfigNR-DEFAULT(Periodical)

Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
periodical SEQUENCE {			PERIODICAL
reportQuantityCell SEQUENCE {			
rsrp	false		
sinr	false		
}			
maxReportCells	2		
}			
}			
}			

7.7.2.1.5 Test requirement

Table 7.7.2.1.5-1 defines the cell specific settings for all tests. Table 7.7.2.1.5-2 defines the OTA primary level settings including test tolerances for all tests.

Each SS-RSRQ measurement report for each of the tests in Table 7.7.2.1.5-2 shall meet the corresponding absolute accuracy requirements in Table 7.7.2.1.5-3.

Table 7.7.2.1.5-1: SS-RSRQ Intra frequency test parameters

Parameter		Unit	Test 1		Test 2	
			Cell 1	Cell 2	Cell 1	Cell 2
SSB ARFCN			Freq1		Freq1	
Duplex mode			TDD		TDD	
TDD configuration			TDDConf.3.1		TDDConf.3.1	
BW$_{channel}$		MHz	100: N$_{RB,c}$ = 66		100: N$_{RB,c}$ = 66	
BWP configuration	Initial DL BWP		DLBWP.0.1			
	Dedicated DL BWP		DLBWP.1.1			
	Initial UL BWP		ULBWP.0.1			
	Dedicated UL BWP		ULBWP.1.1			
TRS configuration			TRS.2.1 TDD		TRS.2.1 TDD	
TCI state			TCI.State.0		TCI.State.0	
PDSCH Reference measurement channel			SR.3.1 TDD		SR.3.1 TDD	
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.1	OP.1	OP.1	OP.1
SMTC configuration			SMTC.1			
SSB configuration			SSB.3 FR2	SSB.3 FR2	SSB.3 FR2	SSB.3 FR2
PDSCH/PDCCH subcarrier spacing		kHz	120	120	120	120
SS-RSSI-Measurement			Not Applicable			
EPRE ratio of PSS to SSS		dB	0	0	0	0
EPRE ratio of PBCH_DMRS to SSS						
EPRE ratio of PBCH to PBCH_DMRS						
EPRE ratio of PDCCH_DMRS to SSS						
EPRE ratio of PDCCH to PDCCH_DMRS						
EPRE ratio of PDSCH_DMRS to SSS						
EPRE ratio of PDSCH to PDSCH_DMRS						
EPRE ratio of OCNG DMRS to SSS[Note 1]						
EPRE ratio of OCNG to OCNG DMRS [Note 1]						
Propagation condition			AWGN		AWGN	
Antenna Configuration			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 Note 3: Void Note 4: Void Note 5: Void.						

Table 7.7.2.1.5-2: SS-RSRQ Intra frequency OTA related test parameters

Parameter	Unit	Test 1 Cell 1	Test 1 Cell 2	Test 2 Cell 1	Test 2 Cell 2
Angle of arrival configuration		Setup 1		Setup 1	
Assumption for UE beams[Note 9]		Rough			
N_{oc} [Note1]	dBm/15kHz[Note4]	-100.7		-96.7	
N_{oc} [Note1]	dBm/SCS[Note3]	-91.67		-87.67	
SSB_RP[Note2]	dBm/SCS [Note4]	-88.67	-88.67	-90.67	-90.67
SS-RSRQ [Note2]	dB	-14.81	-14.81	-16.84	-16.84
$\hat{E}_s / I_{ot}$	dB	-1.76	-1.76	-4.76	-4.76
$\hat{E}_s / N_{oc}$	dB	3	3	-3	-3
Io[Note2]	dBm/95.04 MHz [Note4]	-55.7		-55.67	-55.67

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

Note 3: SS-RSRQ and SSB_RP 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

Note 8: Void

Note 9: Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6], and does not limit UE implementation or test system implementation

Table 7.7.2.1.5-3: SS-RSRQ Intra frequency absolute accuracy requirements for the reported values

UE Power Class 3	Test 1 (All bands)	Test 2	
Normal Conditions			
Lowest reported value (Cell 2)	SS-RSRQ_41	n257, n258, n261	SS-RSRQ_35
		n260	SS-RSRQ_34
		n259	FFS
Highest reported value (Cell 2)	SS-RSRQ_73	All bands	SS-RSRQ_71
Extreme Conditions			
Lowest reported value (Cell 2)	SS-RSRQ_38+ FFS	n257, n258, n261	SS-RSRQ_34+ FFS
		n260	SS-RSRQ_33+ FFS
		n259	FFS
Highest reported value (Cell 2)	SS-RSRQ_76+ FFS	All bands	SS-RSRQ_72+ FFS

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

7.7.2.2 NR SA FR2-FR2 SS-RSRQ measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

7.7.2.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-RSRP measurement accuracy is within the specified limits for all bands.

7.7.2.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.7.2.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.2.2.

7.7.2.2.4 Test description

Two cells are configured in this test: Cell 1 is the NR FR2 serving cell and Cell 2 is the inter-frequency NR FR2 neighbour cell.

7.7.2.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.2.2.4.1-1.

Table 7.7.2.2.4.1-1: Supported test configurations

Configuration	Description
7.7.2.2-1	NR 120 kHz SSB SCS, 100 MHz bandwidth, FDD duplex mode
Note:	The UE is only required to be tested in one of the supported test configurations

Configure the test equipment and the DUT according to the parameters in Table 7.7.2.2.4.1-2.

Table 7.7.2.2.4.1-2: Initial conditions

Parameter	Value	Comment
Test environment	NC	As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1.	
Channel bandwidth	As specified by the selected test configuration.	
Propagation conditions	AWGN	As specified in Annex C.2.1
Connection Diagram	TE Part: A.3.3.1.1 DUT Part: A.3.4.1.1	As specified in TS 38.508-1 [14] Annex A.
Exceptions to connection diagram	N/A	

1. The general test parameter settings are set up according to Table 7.7.2.2.4.1-3.

2. Message contents are defined in clause 7.7.2.2.4.3.

3. There are two inter-frequency cells specified in the test, where Cell 1 is the serving cell on an NR FR2 carrier and Cell 2 is the neighbour cell on a different NR FR2 carrier and the target cell for the SS-RSRQ measurements.

4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

7.7.2.2.4.2 Test procedure

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

2. Set the parameters according to Table 7.7.2.2.5-1 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1.

4. The UE shall transmit an RRCReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the SS-RSRQ reported values in the periodic MeasurementReport for the following requirements:

   - R1: The SS-RSRQ value of Cell 1 reported by the UE is compared to the expected SS-RSRQ for Cell 1. If the value is outside the limits in Table 7.7.2.2.5-3 or the UE fails to report the measurement value for Cell 1, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R1 is increased by one.

   - R2: The SS-RSRQ value of Cell 2 reported by the UE is compared to the expected SS-RSRQ for Cell 2. If the value is outside the limits in Table 7.7.2.2.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

   - R3: The SS-RSRQ value of Cell 2 reported by the UE is compared to the reported SS-RSRQ of Cell 1. If the resulting value is outside the limits in Table 7.7.2.2.5-4 or the UE fails to report the measurement value for Cell 1 or Cell 2, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 7.7.2.2.5-2 as appropriate and repeat steps 5-7. In Step 6, the SS shall check the following requirements:

   - R4: The SS-RSRQ value of Cell 1 reported by the UE is compared to the expected SS-RSRQ for Cell 1. If the value is outside the limits in Table 7.7.2.2.5-3 or the UE fails to report the measurement value for Cell 1, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

   - R5: The SS-RSRQ value of Cell 2 reported by the UE is compared to the expected SS-RSRQ for Cell 2. If the value is outside the limits in Table 7.7.2.2.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R5 is increased by one. Otherwise, the number of passed iterations for R5 is increased by one.

   - R6: The SS-RSRQ value of Cell 2 reported by the UE is compared to the reported SS-RSRQ of Cell 1. If the resulting value is outside the limits in Table 7.7.2.2.5-4 or the UE fails to report the measurement value for Cell 1 or Cell 2, the number of failed iterations for R6 is increased by one. Otherwise, the number of passed iterations for R6 is increased by one.

7.7.2.2.4.3 Message contents

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

Table 7.7.2.2.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells Table H.3.1-5 Table H.3.1-6 with condition Pattern #0 Table H.3.1-7 with condition INTER-FREQ Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 7.7.2.2.4.3-2: ReportConfigNR-DEFAULT(Periodical)

Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
periodical SEQUENCE {			PERIODICAL
reportQuantityCell SEQUENCE {			
rsrp	false		
sinr	false		
}			
maxReportCells	2		
}			
}			
}			

7.7.2.2.5 Test requirement

Table 7.7.2.2.5-1 defines the cell specific settings for all tests. Table 7.7.2.2.5-2 defines the OTA primary level settings including test tolerances for all tests.

The SS-RSRQ measurement accuracy shall fulfil the absolute accuracy requirements in clause 7.7.2.0.2.1 and relative accuracy requirements in clause 7.7.2.0.2.2. The following eight requirements are to be verified:

During T1:

R1: Absolute accuracy of Cell 1. The UE is deemed to meet the requirement if the reported SS-RSRQ is in the range shown in Table 7.7.2.2.5-3.

R2: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRQ is in the range shown in Table 7.7.2.2.5-3.

R3: Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported SS-RSRQ meets the requirements in Table 7.7.2.2.5-4.

During T2:

R4: Absolute accuracy of Cell 1. The UE is deemed to meet the requirement if the reported SS-RSRQ is in the range shown in table 7.7.2.2.5-3.

R5: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-RSRQ is in the range shown in table 7.7.2.2.5-3.

R6: Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported SS-RSRQ meets the requirements in Table 7.7.2.2.5-4.

Table 7.7.2.2.5-1: SS-RSRQ Inter frequency general test parameters

Parameter	Unit	Test 1		Test 2	
		Cell 1	Cell 2	Cell 1	Cell 2
SSB ARFCN		Freq1	freq2	freq1	Freq2
SSB Configuration		SSB.1 FR2	SSB.1 FR2	SSB.1 FR2	SSB.1 FR2
Duplex mode		TDD		TDD	
TDD configuration		TDDConf.3.1		TDDConf.3.1	
BW$_{channel}$	MHz	100: N$_{RB,c}$ = 66		100: N$_{RB,c}$ = 66	
Data RBs allocated		66		66	
Downlink initial BWP configuration		DLBWP.0.1	-	DLBWP.0.1	-
Downlink dedicated BWP configuration		DLBWP.1.1	-	DLBWP.1.1	-
Uplink initial BWP configuration		ULBWP.0.1	-	ULBWP.0.1	-
Uplink dedicated BWP configuration		ULBWP.1.1	-	ULBWP.1.1	-
DRX cycle configuration		Not applicable	-	Not applicable	-
TRS configuration		TRS.2.1 TDD	-	TRS.2.1 TDD	-
TCI state		TCI.State.0	-	TCI.State.0	-
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	dB	0	0	0	0
EPRE ratio of PBCH_DMRS to SSS					
EPRE ratio of PBCH to PBCH_DMRS					
EPRE ratio of PDCCH_DMRS to SSS					
EPRE ratio of PDCCH to PDCCH_DMRS					
EPRE ratio of PDSCH_DMRS to SSS					
EPRE ratio of PDSCH to PDSCH_DMRS					
EPRE ratio of OCNG DMRS to SSS[Note 1]					
EPRE ratio of OCNG to OCNG DMRS [Note 1]					
Propagation conditions		AWGN	AWGN	AWGN	AWGN
Antenna configuration		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 Note 3: Void Note 4: Void					

Table 7.7.2.2.5-2: SS-RSRQ Inter frequency OTA related test parameters

Parameter	Unit	Test 1		Test 2	
		Cell 1	Cell 2	Cell 1	Cell 2

AoA setup		Setup 1		Setup 1	
Assumption for UE beams[Note 8]		Rough		Rough	
N_{oc} [Note1]	dBm/15kHz[Note4]	-95.93	-95.93	-95.44	-95.44
N_{oc} [Note1]	dBm/SCS[Note3]	-86.9	-86.9	-86.41	-86.41
$\hat{E}_s/N_{oc}$	dB	-1.75	-1.75	-3	-3
SSB_RP[Note2]	dBm/SCS [Note4]	-88.65	-88.65	-89.41	-89.41
SS-RSRQ[Note2]	dB	-14.75	-14.75	-15.56	-15.56
$\hat{E}_s/I_{ot}$	dB	-1.75	-1.75	-3	-3
Io[Note2]	dBm/95.04 MHz [Note4]	-55.7	-55.7	-55.7	-55.7
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 Io 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					
Note 8: Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6], and does not limit UE implementation or test system implementation					

Table 7.7.2.2.5-3: evaluation limits for the reported values for T1 and T2 absolute accuracy rules R1, R2, R4, R5

UE power class 3		
Normal Conditions	**Test 1** **All bands**	**Test 2** **All bands**
Lowest reported value (Cell 1)	RSRQ_41	RSRQ_37
Highest reported value (Cell 1)	RSRQ_73	RSRQ_74
Lowest reported value (Cell 2)	RSRQ_41	RSRQ_37
Highest reported value (Cell 2)	RSRQ_73	RSRQ_74
Extreme Conditions	**Test 1** **All bands**	**Test 2** **All bands**
Lowest reported value (Cell 1)	RSRQ_41 + FFS	RSRQ_37 + FFS
Highest reported value (Cell 1)	RSRQ_73 + FFS	RSRQ_74 + FFS
Lowest reported value (Cell 2)	RSRQ_41 + FFS	RSRQ_37 + FFS
Highest reported value (Cell 2)	RSRQ_73 + FFS	RSRQ_74 + FFS

Table 7.7.2.2.5-4: evaluation limits for the reported values for T1 and T2 relative accuracy rules R3, R6

UE power class 3		
Normal Conditions	**Test 1** **All bands**	**Test 2** **All bands**
Lowest value (RSRQ report Cell 2 – RSRQ report Cell 1)	- 7	- 9
Highest value (RSRQ report Cell 2 – RSRQ report Cell 1)	+ 7	+ 9
Extreme Conditions	**Test 1** **All bands**	**Test 2** **All bands**
Lowest value (RSRQ report Cell 2 – RSRQ report Cell 1)	− 7 + FFS	− 9 + FFS
Highest value (RSRQ report Cell 2 – RSRQ report Cell 1)	+ 7 + FFS	+ 9 + FFS

For the test to pass, the ratio of successful reported values for each requirement (R1 to R6) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

7.7.3 SS-SINR

7.7.3.0 Minimum conformance requirements

7.7.3.0.1 Intra-frequency SS-SINR measurement accuracy requirements

Same as in clause 5.7.3.0.1.

7.7.3.0.2 Inter-frequency SS-SINR measurement accuracy requirements

Same as in clause 5.7.3.0.2.

7.7.3.1 NR SA FR2 SS-SINR measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

7.7.3.1.1 Test purpose

The purpose of this test is to verify that the intra-frequency SS-SINR measurement accuracy is within the specified limits for all bands.

7.7.3.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards supporting ss-SINR-Meas.

7.7.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.3.1.

7.7.3.1.4 Test description

Two cells are configured in this test: Cell 1 is the NR FR2 serving cell and Cell 2 is the intra-frequency NR FR2 neighbour cell.

7.7.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.3.1.4.1-1.

Table 7.7.3.1.4.1-1: Supported test configurations

Configuration	Description
7.7.3.1-1	NR 120 kHz SSB SCS, 100 MHz bandwidth, FDD duplex mode
Note:	The UE is only required to be tested in one of the supported test configurations

Configure the test equipment and the DUT according to the parameters in Table 7.7.3.1.4.1-2.

Table 7.7.3.1.4.1-2: Initial conditions

Parameter	Value	Comment
Test environment	NC	As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1.	
Channel bandwidth	As specified by the selected test configuration.	
Propagation conditions	AWGN	As specified in Annex C.2.1
Connection Diagram	TE Part: A.3.3.1.1 DUT Part: A.3.4.1.1	As specified in TS 38.508-1 [14] Annex A.
Exceptions to connection diagram	N/A	

1. The general test parameter settings are set up according to Table 7.7.3.1.4.1-3.

2. Message contents are defined in clause 7.7.3.1.4.3.

3. There are two intra-frequency cells specified in the test, where Cell 1 is the NR FR2 serving cell and Cell 2 is the neighbour cell on the same NR FR2 carrier and the target cell for the SS-SINR measurements.

4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

7.7.3.1.4.2   Test procedure

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

2. Set the parameters according to Table 7.7.3.1.5-1 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1.

4. The UE shall transmit an RRCReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the SS-SINR reported values in the periodic MeasurementReport. The SS-SINR value of Cell 2 reported by the UE is compared to the expected SS-SINR. If the value is outside the limits in Table 7.7.3.1.5-2 or the UE fails to report the measurement value for Cell 2, the number of failed iterations is increased by one. Otherwise, the number of passed iterations is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 7.7.3.1.5-1 as appropriate and repeat steps 5-7.

7.7.3.1.4.3   Message contents

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

Table 7.7.3.1.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.1-3 with Condition Synchronous cells Table H.3.1-5 Table H.3.1-7 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 7.7.3.1.4.3-2: ReportConfigNR-DEFAULT(Periodical)

Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
periodical SEQUENCE {			PERIODICAL
reportQuantityCell SEQUENCE {			
rsrp	false		
rsrq	false		
}			
maxReportCells	2		
}			
}			
}			

7.7.3.1.5   Test requirement

Table 7.7.3.1.5-1 defines the cell specific settings for all tests. Table 7.7.3.1.5-2 defines the OTA primary level settings including test tolerances for all tests.

Each SS-SINR measurement report for each of the tests in Table 7.7.3.1.5-2 shall meet the corresponding absolute accuracy requirements in Table 7.7.3.1.5-3.

Table 7.7.3.1.5-1: SS-SINR Intra frequency test parameters

Parameter	Unit	Test 1		Test 2	
		Cell 1	Cell 2	Cell 1	Cell 2
SSB ARFCN		**Freq2**		**Freq2**	
Duplex mode		TDD		TDD	
TDD configuration		TDDConf.3.1		TDDConf.3.1	
$BW_{channel}$	MHz	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
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			
PDSCH Reference measurement channel		SR.3.1 TDD		SR.3.1 TDD	
RMSI CORESET Reference Channel		CR.3.1 TDD	-	CR.3.1 TDD	-
Dedicated RMSI CORESET Reference Channel		CCR.3.1 TDD	-	CCR.3.1 TDD	-
OCNG Patterns		OP.1	OP.1	OP.1	OP.1
SMTC configuration		SMTC.1			
SSB configuration		SSB.3 FR2	SSB.3 FR2	SSB.3 FR2	SSB.3 FR2
PDSCH/PDCCH subcarrier spacing	kHz	120	120	120	120
SS-RSSI-Measurement		Not Applicable			
EPRE ratio of PSS to SSS	dB	0	0	0	0
EPRE ratio of PBCH_DMRS to SSS					
EPRE ratio of PBCH to PBCH_DMRS					
EPRE ratio of PDCCH_DMRS to SSS					
EPRE ratio of PDCCH to PDCCH_DMRS					
EPRE ratio of PDSCH_DMRS to SSS					
EPRE ratio of PDSCH to PDSCH_DMRS					
EPRE ratio of OCNG DMRS to SSS[Note 1]					
EPRE ratio of OCNG to OCNG DMRS [Note 1]					
Propagation condition		AWGN		AWGN	
Antenna Configuration		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. Note 3: Void Note 4: Void					

Table 7.7.3.1.5-2: SS-SINR Intra frequency OTA related test parameters

Parameter		Unit	Test 1		Test 2	
			Cell 1	Cell 2	Cell 1	Cell 2
Angle of arrival configuration			Setup 1		Setup 1	
Assumption for UE beams[Note 9]			Rough		Rough	
N_{oc} [Note1]		dBm/15kHz [Note4]	-105		-105	
N_{oc} [Note1]		dBm/SCS [Note3]	-96		-96	
SSB_RP[Note2]		dBm/SCS [Note4]	-91.46	-93.34	-98.8	-98.8
SS-SINR [Note2]	n257, 258, n261	dB	-0.18	-3.32	-4.95	-4.95
	n260		-0.31	-3.42	-5.20	-5.20
	n259		-0.39	-3.48	-5.48	-5.48
$\hat{E}_s/I_{ot}$	n257, 258, n261	dB	-0.18	-3.32	-4.95	-4.95
	n260		-0.31	-3.42	-5.20	-5.20
	n259		-0.39	-3.48	-5.48	-5.48
$\hat{E}_s/N_{oc}$		dB	4.54	2.66	-3	-3
Io[Note2]		dBm/95.04 MHz [Note4]	-59.43		-63.87	

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, SSB_RP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 3: SS-SINR and SSB_RP 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

Note 8: Void

Note 9: Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6], and does not limit UE implementation or test system implementation

Table 7.7.3.1.5-3: SS-SINR Intra frequency absolute accuracy requirements for the reported values

UE Power Class 3		Test 1		Test 2	
Normal Conditions					
Lowest reported value (Cell 2)	n257, n258, n261	SS-SINR_22	All bands	SS-SINR_18	
	n260	SS-SINR_21			
	n259	FFS			
Highest reported value (Cell 2)	All bands	SS-SINR_58	n257, n258, n261	SS-SINR_55	
			n260	SS-SINR_54	
			n259	FFS	
Extreme Conditions					
Lowest reported value (Cell 2)	n257, n258, n261	SS-SINR_21+ FFS	All bands	SS-SINR_17+ FFS	
	n260	SS-SINR_20+ FFS			
	n259	FFS			
Highest reported value (Cell 2)	All bands	SS-SINR_59+ FFS	n257, n258, n261	SS-SINR_56+ FFS	
			n260	SS-SINR_55+ FFS	
			n259	FFS	

For the test to pass, the ratio of successful reported values in each test shall be more than 90% with a confidence level of 95%.

7.7.3.2 NR SA FR2-FR2 SS-SINR measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

7.7.3.2.1 Test purpose

The purpose of this test is to verify that the inter-frequency SS-SINR measurement accuracy is within the specified limits for all bands.

7.7.3.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards supporting ss-SINR-Meas.

7.7.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.3.2.

7.7.3.2.4 Test description

Two cells are configured in this test: Cell 1 is the NR FR2 serving cell and Cell 2 is the inter-frequency NR FR2 neighbour cell.

7.7.3.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.3.2.4.1-1.

Table 7.7.3.2.4.1-1: Supported test configurations

Configuration	Description
7.7.3.2-1	NR 120 kHz SSB SCS, 100 MHz bandwidth, FDD duplex mode
Note:	The UE is only required to be tested in one of the supported test configurations

Configure the test equipment and the DUT according to the parameters in Table 7.7.3.2.4.1-2.

Table 7.7.3.2.4.1-2: Initial conditions

Parameter	Value	Comment
Test environment	NC	As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1.	
Channel bandwidth	As specified by the selected test configuration.	
Propagation conditions	AWGN	As specified in Annex C.2.1
Connection Diagram	TE Part: A.3.3.1.1 DUT Part: A.3.4.1.1	As specified in TS 38.508-1 [14] Annex A.
Exceptions to connection diagram	N/A	

1. The general test parameter settings are set up according to Table 7.7.3.2.4.1-3.

2. Message contents are defined in clause 7.7.3.2.4.3.

3. There are two inter-frequency cells specified in the test, where Cell 1 is the serving cell on an NR FR2 carrier and Cell 2 is the neighbour cell on a different NR FR2 carrier and the target cell for the SS-SINR measurements.

4. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

7.7.3.2.4.2   Test procedure

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

2. Set the parameters according to Table 7.7.3.2.5-1 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1.

4. The UE shall transmit an RRCReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

6. After 10s wait from Step 3, the SS shall check the SS-SINR reported values in the periodic MeasurementReport for the following requirements:

   - R1: The SS-SINR value of Cell 1 reported by the UE is compared to the expected SS-SINR for Cell 1. If the value is outside the limits in Table 7.7.3.2.5-3 or the UE fails to report the measurement value for Cell 1, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R1 is increased by one.

   - R2: The SS-SINR value of Cell 2 reported by the UE is compared to the expected SS-SINR for Cell 2. If the value is outside the limits in Table 7.7.3.2.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

   - R3: The SS-SINR value of Cell 2 reported by the UE is compared to the reported SS-SINR of Cell 1. If the resulting value is outside the limits in Table 7.7.3.2.5-4 or the UE fails to report the measurement value for Cell 1 or Cell 2, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

7. The SS shall continue checking the MeasurementReport messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

8. Set the parameters according to each sub-test in Table 7.7.3.2.5-2 as appropriate and repeat steps 5-7. In Step 6, the SS shall check the following requirements for Test 2:

- R4: The SS-SINR value of Cell 1 reported by the UE is compared to the expected SS-SINR for Cell 1. If the value is outside the limits in Table 7.7.3.2.5-3 or the UE fails to report the measurement value for Cell 1, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

- R5: The SS-SINR value of Cell 2 reported by the UE is compared to the expected SS-SINR for Cell 2. If the value is outside the limits in Table 7.7.3.2.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R5 is increased by one. Otherwise, the number of passed iterations for R5 is increased by one.

- R6: The SS-SINR value of Cell 2 reported by the UE is compared to the reported SS-SINR of Cell 1. If the resulting value is outside the limits in Table 7.7.3.2.5-4 or the UE fails to report the measurement value for Cell 1 or Cell 2, the number of failed iterations for R6 is increased by one. Otherwise, the number of passed iterations for R6 is increased by one.

And the following requirements for Test 3:

- R7: The SS-SINR value of Cell 1 reported by the UE is compared to the expected SS-SINR for Cell 1. If the value is outside the limits in Table 7.7.3.2.5-3 or the UE fails to report the measurement value for Cell 1, the number of failed iterations for R7 is increased by one. Otherwise, the number of passed iterations for R7 is increased by one.

- R8: The SS-SINR value of Cell 2 reported by the UE is compared to the expected SS-SINR for Cell 2. If the value is outside the limits in Table 7.7.3.2.5-3 or the UE fails to report the measurement value for Cell 2, the number of failed iterations for R8 is increased by one. Otherwise, the number of passed iterations for R8 is increased by one.

- R9: The SS-SINR value of Cell 2 reported by the UE is compared to the reported SS-SINR of Cell 1. If the resulting value is outside the limits in Table 7.7.3.2.5-4 or the UE fails to report the measurement value for Cell 1 or Cell 2, the number of failed iterations for R9 is increased by one. Otherwise, the number of passed iterations for R9 is increased by one.

7.7.3.2.4.3 Message contents

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

Table 7.7.3.2.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with condition INTER-FREQ and GAP NEEDED Table H.3.1-3 with Conditions INTER-FREQ MO and Synchronous cells Table H.3.1-5 Table H.3.1-6 with condition Pattern #0 Table H.3.1-7 with condition INTER-FREQ Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 7.7.3.1.4.3-2: ReportConfigNR-DEFAULT(Periodical)

Derivation Path: 38.508-1 [14] Table 4.6.3-142 with condition PERIODICAL			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
periodical SEQUENCE {			PERIODICAL
reportQuantityCell SEQUENCE {			
rsrp	false		
rsrq	false		
}			
maxReportCells	2		
}			
}			
}			

7.7.3.2.5   Test requirement

Table 7.7.3.2.5-1 defines the cell specific settings for all tests. Table 7.7.3.2.5-2 defines the OTA primary level settings including test tolerances for all tests.

The SS-SINR measurement accuracy shall fulfil the absolute accuracy requirements in clause 7.7.3.0.2.1 and relative accuracy requirements in clause 7.7.3.0.2.2. The following eight requirements are to be verified:

During Test 1:

R1: Absolute accuracy of Cell 1. The UE is deemed to meet the requirement if the reported SS-SINR is in the range shown in Table 7.7.3.2.5-3.

R2: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-SINR is in the range shown in Table 7.7.3.2.5-3.

R3: Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported SS-SINR meets the requirements in Table 7.7.3.2.5-4.

During Test 2:

R4: Absolute accuracy of Cell 1. The UE is deemed to meet the requirement if the reported SS-SINR is in the range shown in table 7.7.3.2.5-3.

R5: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-SINR is in the range shown in table 7.7.3.2.5-3.

R6: Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported SS-SINR meets the requirements in Table 7.7.3.2.5-4.

During Test 3:

R7: Absolute accuracy of Cell 1. The UE is deemed to meet the requirement if the reported SS-SINR is in the range shown in table 7.7.3.2.5-3.

R8: Absolute accuracy of Cell 2. The UE is deemed to meet the requirement if the reported SS-SINR is in the range shown in table 7.7.3.2.5-3.

R9: Relative accuracy of Cell 2 compared with Cell 1. The UE is deemed to meet the requirement if the difference in reported SS-SINR meets the requirements in Table 7.7.3.2.5-4.

Table 7.7.3.2.5-1: SS-SINR Inter frequency general test parameters

Parameter	Unit	Test 1		Test 2		Test 3	
		Cell 1	Cell 2	Cell 1	Cell 2	Cell 1	Cell 2
SSB ARFCN		freq1	freq2	freq1	freq2	freq1	freq2
Duplex mode		TDD		TDD		TDD	
TDD configuration		TDDConf.3.1		TDDConf.3.1		TDDConf.3.1	
$BW_{channel}$	MHz	100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66		100: $N_{RB,c}$ = 66	
Data RBs allocated		66		66		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					
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. 1 FR2	SMTC. 1 FR2	SMTC. 1 FR2	SMTC. 1 FR2	SMTC. 1 FR2	SMTC. 1 FR2
SSB configuration		SSB.3 FR2	SSB.3 FR2	SSB.3 FR2	SSB.3 FR2	SSB.3 FR2	SSB.3 FR2
PDSCH/PDCCH subcarrier spacing	kHz	120	120	120	120	120	120
EPRE ratio of PSS to SSS	dB	0	0	0	0	0	0
EPRE ratio of PBCH_DMRS to SSS							
EPRE ratio of PBCH to PBCH_DMRS							
EPRE ratio of PDCCH_DMRS to SSS							
EPRE ratio of PDCCH to PDCCH_DMRS							
EPRE ratio of PDSCH_DMRS to SSS							
EPRE ratio of PDSCH to PDSCH_DMRS							
EPRE ratio of OCNG DMRS to SSS[Note 1]							
EPRE ratio of OCNG to OCNG DMRS [Note 1]							
Propagation conditions		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: Void Note 3: Void Note 4: Void							

Table 7.7.3.2.5-2: SS-SINR Inter frequency OTA related test parameters

Parameter	Unit	Test 1		Test 2		Test 3	
		Cell 1	Cell 2	Cell 1	Cell 2	Cell 1	Cell 2

Angle of arrival configuration	degrees	Setup 1		Setup 1		Setup 1	
Assumption for UE beams[Note 10]		Rough		Rough		Rough	
$N_{oc \text{ Note1}}$	dBm/15kHz [Note4]	-105	-105	-105.1	-105.1	-105	-105
$N_{oc \text{ Note1}}$	dBm/SCS [Note3]	-96	-96	-96.1	-96.1	-96	-96
$\hat{E}_s/N_{oc}$	dB	-0.5	-0.5	11	11	-2.1	-2.1
SS-RSRP[Note2]	dBm/SCS [Note4]	-96.5	-96.5	-85.1	-85.1	-98.1	-98.1
SS-SINR[Note2]	dB	-0.5	-0.5	11	11	-2.1	-2.1
$\hat{E}_s/I_{ot}$	dB	-0.5	-0.5	11	11	-2.1	-2.1
Io[Note2]	dBm/95.04 MHz [Note4]	-69.3	-69.3	-55.75	-55.75	-64.9	-64.9
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_{oc} to be fulfilled.							
Note 2: SS-SINR, SSB_RP, and Io 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: Void							
Note 7: Void							
Note 8: Void							
Note 9: Void							
Note 10: Information about types of UE beam is given in B.2.1.3 of TS 38.133 [6], and does not limit UE implementation or test system implementation							

Table 7.7.3.2.5-3: evaluation limits for the reported values for T1 and T2 absolute accuracy rules R1, R2, R4, R5

UE power class 3						
Normal Conditions	**Test 1 All bands**		**Test 2 All bands**		**Test 3 All bands**	
Lowest reported value (Cell 1)	SINR_27		SINR_48		n257, n258, n261	SINR_23
					n260	SINR_22
					n259	FFS
Highest reported value (Cell 1)	n257, n258, n261	SINR_62	n257, n258, n261	SINR_87	n257, n258, n261	SINR_60
	n260	SINR_61	n260	SINR_86	n260	SINR_59
	n259	FFS	n259	FFS	n259	FFS
Lowest reported value (Cell 2)	SINR_27		SINR_48		n257, n258, n261	SINR_23
					n260	SINR_22
					n259	FFS
Highest reported value (Cell 2)	n257, n258, n261	SINR_62	n257, n258, n261	SINR_87	n257, n258, n261	SINR_60
	n260	SINR_61	n260	SINR_86	n260	SINR_59
	n259	FFS	n259	FFS	n259	FFS
Extreme Conditions	**Test 1 All bands**		**Test 2 All bands**		**Test 3 All bands**	
Lowest reported value (Cell 1)	SINR_27 + FFS		SINR_48 + FFS		n257, n258, n261	SINR_23 + FFS
					n260	SINR_22 + FfS
					n259	FFS
Highest reported value (Cell 1)	n257, n258, n261	SINR_62 + FFS	n257, n258, n261	SINR_87 + FFS	n257, n258, n261	SINR_60 + FFS
	n260	SINR_61 + FFS	n260	SINR_86 + FFS	n260	SINR_59 + FFS
	n259	FFS	n259	FFS	n259	FFS
Lowest reported value (Cell 2)	SINR_27 + FFS		SINR_48 + FFS		n257, n258, n261	SINR_23 + FFS
					n260	SINR_22 + FfS
					n259	FFS
Highest reported value (Cell 2)	n257, n258, n261	SINR_62 + FFS	n257, n258, n261	SINR_87 + FFS	n257, n258, n261	SINR_60 + FFS
	n260	SINR_61 + FFS	n260	SINR_86 + FFS	n260	SINR_59 + FFS
	n259	FFS	n259	FFS	n259	FFS

Table 7.7.3.2.5-4: evaluation limits for the reported values for T1 and T2 relative accuracy rules R3, R6

UE power class 3			
Normal Conditions	**Test 1 All bands**	**Test 2 All bands**	**Test 3 All bands**
Lowest value (SINR report Cell 2 – SINR report Cell 1)	- 8	- 17	- 9
Highest value (SINR report Cell 2 – SINR report Cell 1)	+ 8	+ 17	+ 9
Extreme Conditions	**Test 1 All bands**	**Test 2 All bands**	**Test 3 All bands**
Lowest value (SINR report Cell 2 – SINR report Cell 1)	– 8 + FFS	– 17 + FFS	– 9 + FFS
Highest value (SINR report Cell 2 – SINR report Cell 1)	+ 8 + FFS	+ 17 + FFS	+ 9 + FFS

For the test to pass, the ratio of successful reported values for each requirement (R1 to R6) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

7.7.4 L1-RSRP

7.7.4.0 Minimum conformance requirements

7.7.4.0.1 SSB-based L1-RSRP absolute measurement accuracy requirements

Same as in clause 5.7.4.0.1.

7.7.4.0.2 SSB-based L1-RSRP relative measurement accuracy requirements

Same as in clause 5.7.4.0.2.

7.7.4.0.3 CSI-RS-based L1-RSRP absolute measurement accuracy requirements

Same as in clause 5.7.4.0.3.

7.7.4.0.4 CSI-RS-based L1-RSRP relative measurement accuracy requirements

Same as in clause 5.7.4.0.4.

7.7.4.1 NR SA FR2 SSB based L1-RSRP measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

   - This test case does not check absolute L1-RSRP test requirement for weaker SSB resource even when it is stated in TS 38.133. L1-RSRP reports defined in TS 38.214 do not include absolute L1-RSRP value for weaker SSB

7.7.4.1.1 Test purpose

The purpose of this test is to verify that the SSB based L1-RSRP absolute measurement accuracy is within the specified limits for all bands.

7.7.4.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.7.4.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.4.0.1 and 7.7.4.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.4.1.

7.7.4.1.4 Test description

7.7.4.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.4.1.4.1-1.

Table 7.7.4.1.4.1-1: Supported test configurations

Test Case ID	Description
7.7.4.1-1	NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode
7.7.4.1-2	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	

Configure the test equipment and the DUT according to the parameters in Table 7.7.4.1.4.1-2.

Table 7.7.4.1.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.7.4.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.3.1-1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 7.7.4.1.4.3.

2. Cell 1 is the NR FR2 cell and the target for SSB-based L1-RSRP measurements. The UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs. The connection setup is done according to the settings in Annex C.1.1.

3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

7.7.4.1.4.2   Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 7.7.4.1.4.1-2.

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

2. Set the parameters according to T1 in Table 7.7.4.1.5-1.

3. After 320 ms from the beginning of T1, the UE shall start sending L1-RSRP report including results of both SSB#0 and SSB#1 every 80 slots.

4. The UE shall start sending valid L1-RSRP reports, a valid report shall meet the absolute L1-RSRP requirement for SSB#0 and the relative L1-RSRP requirement for SSB#1. The SS shall check following requirements:

   - R1: The L1-RSRP value of SSB#0 reported by the UE is compared to the expected L1-RSRP value for SSB#0. If the value is outside the limits in Table 7.7.4.1.5-3 or Table 7.7.4.1.5-4 (depending on the test configuration) or the UE fails to report the measurement value for SSB#0, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R1 is increased by one.

   - R2: The DIFF-RSRP value of SSB#1 reported by the UE is compared to the expected DIFF-RSRP value. If the resulting value is outside the limits in Table 5.7.1.1.5-5 or the UE fails to report the measurement value for SSB#1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

5. The SS shall continue checking the L1-RSRP report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to T2 Table 7.7.4.1.5-1 and repeat steps 3-5. In Step 4, The SS shall check the L1-RSRP reported values of SSB#0 and SSB#1 in the periodic L1-RSRP reports for the following requirements.

- R3: The L1-RSRP value of SSB#0 or SSB#1 reported by the UE is compared to the expected L1-RSRP value. If the value is outside the limits in Table 7.7.4.1.5-3 or Table 7.7.4.1.5-4 (depending on the test configuration) or the UE fails to report the measurement value for SSB#0 or SSB#1, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

- R4: The DIFF-RSRP value of SSB#0 or SSB#1 reported by the UE is compared to the expected DIFF-RSRP value. If the resulting value is outside the limits in Table 5.7.1.1.5-5 or the UE fails to report the measurement value for SSB#0 or SSB#1, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

7.7.4.1.4.3   Message contents

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

Table 7.7.4.1.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.6-2 with conditions PERIODIC and SS-RSRP Table H.3.6-3 with conditions SSB and PERIODIC Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 7.7.4.1.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSBs.	
detectionResource CHOICE {			
ssb-Index	0		
}			
}			
}			

7.7.4.1.5   Test requirement

Table 7.7.4.1.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-RSRP measurement report for each of the tests in Table 7.7.4.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 7.7.4.1.5-2 for test configurations 1, 2, 4 and 5, and the corresponding absolute accuracy requirements in Table 7.7.4.1.5-3 for test configurations 3 and 6 and Table 7.7.4.1.5-3a for all configurations.

Table 7.7.4.1.5-1: L1-RSRP 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$_{channel}$	1,2	MHz	100: N$_{RB,c}$ = 66	100: N$_{RB,c}$ = 66
Data RBs allocated	1,2		66	66
PDSCH Reference measurement channel	1		SR.3.2 TDD	SR.3.2 TDD
	2		SR.3.3 TDD	SR.3.3 TDD
RMSI CORESET Reference Channel	1		CR.3.1 TDD	CR.3.1 TDD
	2		CR.3.2 TDD	CR.3.2 TDD
Dedicated CORESET Reference Channel	1		CCR.3.1 TDD	CCR.3.1 TDD
	2		CCR.3.7 TDD	CCR.3.7 TDD
SSB configuration	1		SSB.1 FR2	SSB.1 FR2
	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		slot320	slot320
Propagation condition	1,2		AWGN	AWGN
Antenna configuration			1x2	1x2
EPRE ratio of PSS to SSS	1,2	dB	0	0
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH DMRS				
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 N_{oc} to be fulfilled.				

Table 7.7.4.1.5-2: L1-RSRP OTA related test parameters

Parameter	Config	Unit	Test 1		Test 2 NOTE 3	
			SSB0	SSB1	SSB0	SSB1
Angle of arrival configuration			Setup 1 according to A.3.15.1		Setup 1 according to A.3.15.1	
Assumption for UE beams Note 4			Rough		Rough	
N_{oc}	1,2	dBm/15 kHz	-104.1		n.a.	
N_{oc}	1	dBm/SSB SCS	-95.1		n.a.	
	2		-92.1		n.a.	
$\hat{E}_s / I_{ot}$	1,2	dB	10	-1.6	n.a.	
SSB_RP Note1	1	dBm/SCS	-85.1	-96.9	As in Table B.2.4-2 + 5.7	
	2		-78	-90	As in Table B.2.4-2 + 5.7	
Io Note1	1,2	dBm/ 95.04MHz	-55.67		SSB_RP+34.68	
$\hat{E}_s / N_{oc}$	1,2	dB	10	-1.6	n.a.	

Note 1: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 2: Void
Note 3: No additional noise is added by the test system in Test 2.
Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation

Table 7.7.4.1.5-3: L1-RSRP absolute accuracy requirements for the reported values for test configurations 1 and 2 for the absolute accuracy rules R1, R3

UE power class 3			
Normal Conditions	**Test 1 All bands**	**Test 2**	
Lowest reported value (SSB#0)	42	n257, n258, n261	27
		n260	30
		n259	FFS
Highest reported value (SSB#0)	101	n257, n258, n261	83
		n260	86
		n259	FFS
Extreme Conditions	**Test 1 All bands**	**Test 2**	
Lowest reported value (SSB#0)	39 + FFS	n257, n258, n261	24 + FFS
		n260	27 + FFS
		n259	FFS
Highest reported value (SSB#0)	104 + FFS	n257, n258, n261	86 + FFS
		n260	89 + FFS
		n259	FFS

Table 7.7.4.1.5-3a: evaluation limits for the Δ(Max-Min) reported values for SSB#0 for rules R1, R2, R4, R5

UE power class 3		
Normal Conditions	**Test 1 All bands**	**Test 2 All bands**
Δ(Max-Min) reported value SSB#0	18	18
Extreme Conditions	**Test 1 All bands**	**Test 2 All bands**
Δ(Max-Min) reported value SSB#0	18 + FFS	18+ FFS

Table 7.7.4.1.5-4: L1-RSRP absolute accuracy requirements for the reported values for test configurations 3 and 4 for the absolute accuracy rules R1, R3

UE power class 3			
Normal Conditions	**Test 1 All bands**	**Test 2**	
Lowest reported value (SSB#0)	45	n257, n258, n261	30
		n260	33
		n259	FFS
Highest reported value (SSB#0)	104	n257, n258, n261	86
		n260	89
		n259	FFS
		n259	FFS
Extreme Conditions	**Test 1 All bands**	**Test 2**	
Lowest reported value (SSB#0)	42+ FFS	n257, n258, n261	27 + FFS
		n260	30 + FFS
		n259	FFS
Highest reported value (SSB#0)	107+ FFS	n257, n258, n261	89 + FFS
		n260	92 + FFS
		n259	FFS

Table 7.7.4.1.5-5: evaluation limits for the reported values for T1 and T2 relative accuracy rules R2, R4

UE power class 3		
Normal Conditions	**Test 1 All bands**	**Test 2 All bands**
Lowest reported value (L1-RSRP SSB#1 – L1-RSRP SSB#0)	2	0
Highest reported value ((L1-RSRP SSB#1 – L1-RSRP SSB#0))	9	4
Extreme Conditions	**Test 1 All bands**	**Test 2 All bands**
Lowest reported value ((L1-RSRP SSB#1 – L1-RSRP SSB#0))	0+ FFS	0+ FFS
Highest reported value ((L1-RSRP SSB#1 – L1-RSRP SSB#0))	12+ FFS	7+ FFS

For the test to pass, the ratio of successful reported values for each requirement (R1 to R6) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

7.7.4.2 NR SA FR2 CSI-RS based L1-RSRP measurement accuracy

Editor's Note: This test case has been completed for the following configurations:

- Test frequency f ≤ 40.8 GHz

- UE PC3

- Normal conditions

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

  - This test case does not check absolute L1-RSRP test requirement for weaker CSI-RS resource even when it is stated in TS 38.133. L1-RSRP reports defined in TS 38.214 do not include absolute L1-RSRP value for weaker CSI-RS

7.7.4.2.1 Test purpose

The purpose of this test is to verify that the CSI-RS based L1-RSRP absolute measurement accuracy is within the specified limits for all bands.

7.7.4.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

7.7.4.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.4.0.3 and 7.7.4.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.4.1.

7.7.4.2.4 Test description

7.7.4.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.4.2.4.1-1.

Table 7.7.4.2.4.1-1: Supported test configurations

Test Case ID	Description
7.7.4.2-1	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	

Configure the test equipment and the DUT according to the parameters in Table 7.7.4.2.4.1-2.

Table 7.7.4.2.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC, TL/VL, TL/VH, TH/VL, TH/VH		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 7.7.4.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 7.7.4.2.4.3.

2. Cell 1 is the NR FR2 cell and the target for CSI-RS-based L1-RSRP measurements. The UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs. The connection setup is done according to the settings in Annex C.1.1.

3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

7.7.4.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 7.7.4.2.4.1-2.

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

2. Set the parameters according to T1 in Table 7.7.4.2.5-1.

3. After 320 ms from the beginning of T1, the UE shall start sending L1-RSRP report including results of both CSI-RS0 and CSI-RS1.

4. The UE shall start sending valid L1-RSRP reports, a valid report shall meet the absolute L1-RSRP requirement for CSI-RS0 and the relative L1-RSRP requirement for CSI-RS1. The SS shall check for the following requirements:

   - R1: The L1-RSRP value of CSI-RS0 reported by the UE is compared to the expected L1-RSRP value for CSI-RS0. If the value is outside the limits in Table 7.7.4.2.5-3 or Table 7.7.4.2.5-4 (depending on the test configuration) or the UE fails to report the measurement value for CSI-RS0, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R1 is increased by one.

   - R2: The DIFF-RSRP value of CSI-RS1 reported by the UE is compared to the expected DIFF-RSRP value. If the resulting value is outside the limits in Table 7.7.4.2.5-4 or the UE fails to report the measurement value for or CSI-RS1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

5. The SS shall continue checking the L1-RSRP report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to T2 Table 7.7.4.2.5-1 and repeat steps 3-5. In Step 4, the SS shall check the L1-RSRP reported values of CSI-RS0 and CSI-RS1 in the periodic L1-RSRP reports for the following requirements.

   - R3: The L1-RSRP value of CSI-RS0 or CSI-RS1 reported by the UE is compared to the expected L1-RSRP value. If the value is outside the limits in Table 7.7.4.2.5-3 or Table 7.7.4.2.5-4 (depending on the test configuration) or the UE fails to report the measurement value for CSI-RS0 or CSI-RS1, the number of failed iterations for R1 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

   - R4: The DIFF-RSRP value of CSI-RS0 or CSI-RS1 reported by the UE is compared to the expected DIFF-RSRP value. If the resulting value is outside the limits in Table 7.7.4.2.5-4 or the UE fails to report the measurement value for CSI-RS0 or CSI-RS1, the number of failed iterations for R4 is increased by one. Otherwise, the number of passed iterations for R4 is increased by one.

7.7.4.2.4.3 Message contents

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

Table 7.7.4.2.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 Table H.3.6-2 with conditions PERIODIC and CSI-RSRP Table H.3.6-3 with conditions CSI-RS and PERIODIC Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 7.7.4.2.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSBs.	
detectionResource CHOICE {			
csi-RS-Index	0		
}			
}			
}			

7.7.4.2.5 Test requirement

Table 7.7.4.2.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-RSRP measurement report for each of the tests in Table 7.7.4.2.5-1 shall meet the corresponding absolute accuracy requirements in Table 7.7.4.2.5-2 for test configurations 1, 2, 4 and 5, and the corresponding absolute accuracy requirements in Table 7.7.4.2.5-3 for test configurations 3 and 6 and Table 7.7.4.2.5-3a for all configurations.

Table 7.7.4.2.5-1: L1-RSRP 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$_{channel}$	1	MHz	100: N$_{RB,c}$ = 66	100: N$_{RB,c}$ = 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.1.1 ULBWP.1.1	DLBWP.1.1 ULBWP.1.1
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		slot320	slot320
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	1	dB	0	0
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH DMRS				
EPRE ratio of OCNG DMRS to SSS[Note 1]				
EPRE ratio of OCNG to OCNG DMRS [Note 1]				
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.				
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.				

Table 7.7.4.2.5-2: L1-RSRP OTA related test parameters

Parameter	Config	Unit	Test 1		Test 2 [NOTE 3]	
			CSI-RS0	CSI-RS1	CSI-RS0	CSI-RS1
Angle of arrival configuration			Setup 1 according to A.3.15.1		Setup 1 according to A.3.15.1	
Assumption for UE beams[Note 4]			Rough		Rough	
N_{oc}	1	dBm/15 kHz	-104.10		n.a.	
N_{oc}	1	dBm/SSB SCS	-95.11		n.a. n.a.	
$\hat{E}_s/I_{ot}$	1	dB	10	-1.8	n.a.	
CSI-RS_RP[Note1]	1	dBm/SCS	-85.11	-96.93	As in Table B.2.4.2-2 + 5.7	
Io[Note1]	1	dBm/ 95.04MHz	-55.67		CSI-RS_RP+34.68	
$\hat{E}_s/N_{oc}$	1	dB	10	-1.82	n.a.	
Note 1: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.						
Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.						
Note 3: No additional noise is added by the test system in Test 2.						
Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation						

Table 7.7.4.2.5-3: L1-RSRP absolute accuracy requirements for the reported values for the absolute accuracy rules R1, R3

UE power class 3			
Normal Conditions	**Test 1 All bands**	**Test 2**	
Lowest reported value (CSI-RS0)	42	n257, n258, n261	27
		n260	30
		n259	FFS
Highest reported value (CSI-RS0)	101	n257, n258, n261	83
		n260	86
		n259	FFS
Extreme Conditions	**Test 1 All bands**	**Test 2**	
Lowest reported value (CSI-RS0)	39+ FFS	n257, n258, n261	25 + FFS
		n260	27 + FFS
		n259	FFS
Highest reported value (CSI-RS0)	104+ FFS	n257, n258, n261	86 + FFS
		n260	89 + FFS
		n259	FFS

Table 7.7.4.2.5-3a: evaluation limits for the Δ(Max-Min) reported values for CSI-RS#0 for rules R1, R3

UE power class 3		
Normal Conditions	**Test 1 All bands**	**Test 2 All bands**
Δ(Max-Min) reported value CSI-RS#0	18	18
Extreme Conditions	**Test 1 All bands**	**Test 2 All bands**
Δ(Max-Min) reported value CSI-RS#0	18 + FFS	18+ FFS

Table 7.7.4.2.5-4: evaluation limits for the reported values for T1 and T2 relative accuracy rules R2, R4

UE power class 3		
Normal Conditions	**Test 1 All bands**	**Test 2 All bands**
Lowest reported value (L1-RSRP CSI-RS1 – L1-RSRP CSI-RS0)	2	0
Highest reported value ((L1-RSRP CSI-RS1 – L1-RSRP CSI-RS0))	9	4
Extreme Conditions	**Test 1 All bands**	**Test 2 All bands**
Lowest reported value ((L1-RSRP CSI-RS1 – L1-RSRP CSI-RS0))	0+ FFS	0+ FFS
Highest reported value ((L1-RSRP CSI-RS1 – L1-RSRP CSI-RS0))	12+ FFS	7+ FFS

For the test to pass, the ratio of successful reported values for each requirement (R1 to R4) shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

7.7.5   SRS-RSRP

7.7.5.0   Minimum conformance requirements

7.7.5.0.1   Minimum conformance requirements for SRS-RSRP measurement accuracy

The SRS-RSRP measurement reported by the UE shall fulfil the accuracy requirements defined in Table 7.7.5.0.1-1 for FR1 and Table 5.7.7.0.1-2 for FR2, provided that the following conditions are met. The accuracy requirements in this clause are derived based on AWGN radio propagation conditions.

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.

- Conditions for SRS-RSRP measurements are fulfilled according to Annex B.2.z for a corresponding Band for each relevant SRS resource configured for measurement.

- The time difference between UE's DL reference timing in the serving cell and SRS arrival time is no larger than $T_{error\_SRS\_RSRP}$, where

  - $T_{error\_SRS\_RSRP} = T_C \times N_{TA\_offset} + 4.67us$ for FR1

  - $T_{error\_SRS\_RSRP} = T_C \times N_{TA\_offset} + 3.67us$ for FR2

  - N_{TA_offset} is defined in Table 7.1.2-2

  - T_C is 0.509ns

- The number of SRS ports in the SRS resource configured for measurement is 1,

- The number of symbols in the SRS resource configured for measurement is 1,

- The number of repetitions in the SRS resource configured for measurement is 1,

- Frequency hopping, sequence group hopping or sequence hopping is disabled in the SRS resource configured for measurement,

- The bandwidth of the SRS resource is 48 PRBs.

- One of the following conditions is met

  - There is no other SRS resource with the same root sequence and on the same symbol and with same comb as the relevant SRS resource.

  - If multiple SRS resources are on the same symbol and with same comb, the distance between cyclic shifts of any two resources is no less than 6 if transmissionComb = n4, and no less than 4 if transmissionComb = n2.

Table 7.7.5.0.1-1: SRS-RSRP absolute accuracy in FR1

Accuracy						Conditions						
Normal condition			Extreme condition			SRS Ês/Iot	Io Note 1 range					
							NR operating band groups Note 2	Minimum Io				Maximum Io
dB						dB		dBm / SCS$_{SRS}$			dBm/BW Channel	dBm/BW Channel
SCS$_{SRS}$ (kHz)			SCS$_{SRS}$ (kHz)									
15	30	60	15	30	60			SCS$_{SRS}$ = 15 kHz	SCS$_{SRS}$ = 30 kHz	SCS$_{SRS}$ = 60 kHz		
±3	±3.5	±5	±7.5	±8	±9.5	≥1	NR_TDD_FR1_A,	-120	-117	-114	N/A	-70
							NR_TDD_FR1_C	-119	-116	-113	N/A	-70
							NR_TDD_FR1_D	-118.5	-115.5	-112.5	N/A	-70
							NR_TDD_FR1_E	-118	-115	-112	N/A	-70
±6.5	±7	±8.5	±9.5	±10	±11.5	≥1	NR_TDD_FR1_A, NR_TDD_FR1_C, NR_TDD_FR1_D, NR_TDD_FR1_E	N/A	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.												

Table 7.7.5.0.1-2: SRS-RSRP absolute accuracy in FR2

Accuracy				Conditions				
Normal condition		Extreme condition		SRS Ês/Iot	Io Note 1 range			
					Minimum Io			Maximum Io
dB				dB	dBm / SCS$_{SRS}$ Note 2		dBm/BW$_{Channel}$	dBm/BW$_{Channel}$
SCS$_{SRS}$ (kHz)		SCS$_{SRS}$ (kHz)			SCS$_{SRS}$ = 60kHz	SCS$_{SRS}$ = 120kHz		
60	120	60	120					
±6	±8.5	±9	±11.5	≥1	Same value as SRS_RP in Table B.2.7-2, according to UE Power class, operating band and angle of arrival		N/A	-70
±9	±11.5	±11	±13.5	≥1	N/A		-70	-50
NOTE 1: Io 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 SSB Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.								

7.7.5.0.1.1 SRS-RSRP report mapping

The reporting range of SRS-RSRP is defined from -140 dBm to -44 dBm with 1 dB resolution. The mapping of measured quantity is defined in Table 5.7.7.0.1.2-1. The range in the signalling may be larger than the guaranteed accuracy range.

Table 5.7.7.0.1.2-1: SRS-RSRP measurement report mapping

Reported value	Measured quantity value	Unit
SRS-RSRP_0	SRS-RSRP<-140	dBm
SRS-RSRP_1	-140≤ SRS-RSRP<-139	dBm
SRS-RSRP_2	-139≤ SRS-RSRP<-138	dBm
SRS-RSRP_3	-138≤ SRS-RSRP<-137	dBm
SRS-RSRP_4	-137≤ SRS-RSRP<-136	dBm
..	..	…
SRS-RSRP_95	-46≤ SRS-RSRP<-45	dBm
SRS-RSRP_96	-45≤ SRS-RSRP<-44	dBm
SRS-RSRP_97	-44≤ SRS-RSRP	dBm
SRS-RSRP_98	Infinity	
Note: 'Infinity' means that UE cannot detect SRS due to too strong signal to measure.		

The normative reference for this requirement is TS 38.133 [6] clause 10.1.22.1.

7.7.5.1 NR SA FR2 SRS-RSRP measurement accuracy

Editor's Note: This test case is incomplete. Following aspects are either missing or TBD

- The test procedure is incomplete

- The message content is FFS

- MU/TT analysis is FFS

7.7.5.1.1 Test purpose

The purpose of this test is to verify that the SRS-RSRP measurement accuracy is within the specified limits with SRS-RSRP measurement requirements in TS 38.133 [6] clause 10.1.22.1.1.

7.7.5.1.2 Test applicability

This test applies to all types of NR UE release 16 onwards and supporting CLI-SRS-RSRP.

7.7.5.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.5.1.

7.7.5.1.4 Test description

7.7.5.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.5.1.4.1-1.

Table 7.7.5.1.4.1-1: Applicable NR configurations for FR2 SRS-RSRP accuracy test

Config	Description
1	120 kHz SRS SCS, 100 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	

Configure the test equipment and the DUT according to the parameters in Table 7.7.5.1.4.1-2.

Table 7.7.5.1.4.1-2: Initial conditions SA FR2 SRS-RSRP measurement accuracy

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.6.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2
Connection Diagram	TE Part	A.3.3.1.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.4.1.1	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 7.7.5.1.4.3.

2. In this set of test cases there is one cell in the test, FR2 PCell (Cell 1). The test parameters for the Cell 1 are given in Table 7.7.5.1.5-1 and Table 7.7.5.1.5-2 below. The test parameter for the (virtual) neighbour cell UE transmitting SRS are given in Table 7.7.5.1.5-2.

3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

7.7.5.1.4 Test description

7.7.5.1.4.1 Initial conditions

7.7.5.1.4.2 Test procedure

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

2. Set the parameters according to Table 7.7.5.1.5-1 as appropriate.

3. The SS shall transmit an RRCReconfiguration message on Cell 1.

4. The UE shall transmit an RRCReconfigurationComplete message.

5. The UE shall transmit periodically MeasurementReport messages.

<rest of the steps are FFS >

7.7.5.1.4.3 Message contents

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

FFS

7.7.5.1.5 Test requirement

Table 7.7.5.1.5-1 defines the cell specific settings for all tests. Table 7.7.5.1.5-2 defines the OTA primary level settings including test tolerances for all tests.

Table 7.7.5.1.5-1: FR2 test parameters for SRS-RSRP accuracy

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
$BW_{channel}$	1	MHz	100: $N_{RB,c}$ = 66	100: $N_{RB,c}$ = 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.3 FR2	SSB.3 FR2
OCNG Patterns	1		OP.1	OP.1
TRS configuration	1		TRS.2.1 TDD	TRS.2.1 TDD
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
SMTC configuration	1		SMTC.1	SMTC.1
Time offset between DL from serving cell and SRS from test system	1	μs	10.76	10.67
EPRE ratio of PSS to SSS	1	dB	0	0
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH DMRS				
EPRE ratio of OCNG DMRS to SSS[Note 1]				
EPRE ratio of OCNG to OCNG DMRS [Note 1]				
Propagation condition	1		AWGN	AWGN
Antenna configuration	1		1x2	1x2
Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.				

Table 7.7.5.1.5-2: SRS-RSRP accuracy OTA related test parameters for PCell and Neighbour cell UE in FR2

Parameter	Unit	T1	T2
Angle of arrival configuration		Setup 1 defined A.3.15.1	Setup 1 defined A.3.15.1
Beam assumption Note 5		Fine	Fine
N_{oc} Note1	dBm/15kHz Note3	-100	N/A
N_{oc} Note1	dBm/SCS Note3	-91	N/A
$\hat{E}_s / N_{oc}$	dB	2	N/A
E_s	dBm/SCS Note3		(Table B.2.7-2 Rx Beam Peak)
SRS_RP Note2	dBm/SCS	-89	(Table B.2.7-2 Rx Beam Peak)
$\hat{E}_s / I_{ot\ BB}$ Note4	dB	>1	1
Io Note2	dBm/95.04 MHz Note3	-57.89	(Table B.2.7-2 Rx Beam Peak +50.79dB)
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:	SRS_RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.		
Note 3:	Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone		
Note 4:	Calculation of Es/Iot_BB 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 ∑MB_P from TS 38.101-2 [19] Table 6.2.1.3-4.		
Note 5:	Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.		

Table 7.7.5.1.5-3: SRS configuration parameters for FR2 SRS-RSRP accuracy

	Field	**SRSConf.1**
SRS-ResourceSet	srs-ResourceSetId	0
	srs-ResourceIdList	0
	resourceType	Periodic
	Usage	Codebook
SRS-Resource	SRS-ResourceId	0
	nrofSRS-Ports	Port1
	transmissionComb	n2
	combOffset-n2	0
	cyclicShift-n2	0
	resourceMapping startPosition	0
	resourceMapping nrofSymbols	n1
	resourceMapping repetitionFactor	n1
	freqDomainPosition	0
	freqDomainShift	0
	freqHopping c-SRS	12
	freqHopping b-SRS	0
	freqHopping b-hop	0
	groupOrSequenceHopping	Neither
	resourceType	Periodic
	periodicityAndOffset-p	sl160,25
	sequenceId	0

Table 7.7.5.1.5-4: SRS-RSRP absolute accuracy test requirement

	Test requirement [Notes1,2,3]
SRS	SRS_RP $-\delta + G_{min} \leq$ Reported SRS-RSRP(dBm) $\leq$ SRS_RP $+\delta + G_{max}$
Note 1:	SRS_RP is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test
Note 2:	δ is the RSRP absolute accuracy requirement from Table 10.1.22.1.1-2, selected according to the Io used in the test
Note 3:	G_{min} and G_{max} are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class

The SRS-RSRP measurement accuracy shall fulfil the absolute accuracy requirements in clauses 7.7.5.0. The following requirements are to be verified:

During T1:

The UE is deemed to meet the requirement if the reported SRS-RSRP is in the range shown in table 7.7.5.1.5-4.

During T2:

The UE is deemed to meet the requirement if the reported SRS-RSRP is in the range shown in table 7.7.5.1.5-4.

For the test to pass, the ratio of successful reported values for each requirement shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

7.7.6 L1-SINR

7.7.6.0 Minimum conformance requirements

7.7.6.0.1 Minimum conformance requirements for CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off

Dedicated resource configured as IMR for L1-SINR computation, and the UE physical layer shall be capable of reporting L1-SINR measured over the measurement period of $T_{\text{L1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_Only}}$.

The value of $T_{\text{L1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_Only}}$ is defined in Table 7.7.6.0.1-1 for FR2, where

For the value of M,

- For periodic and semi-persistent CSI-RS resources as CMR, M=1 if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and M=3 otherwise;

- For aperiodic CSI-RS resources as CMR, M=1.

For the value of N in FR2

- For periodic CSI-RS resources as CMR 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 or L1-SINR measurement, or

  - another CSI-RS in resource set configured with repetition ON.

- For periodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / $N_{\text{res\_per\_set}}$), where $N_{\text{res\_per\_set}}$ 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 as CMR 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 has QCL-TypeD with

  - SSB for L1-RSRP or L1-SINR measurement, or

  - another CSI-RS in resource set configured with repetition ON.

- For semi-persistent CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / $N_{\text{res\_per\_set}}$), where $N_{\text{res\_per\_set}}$ 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 as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided *qcl-info* is configured for all resources in the resource set and for each resource has QCL-TypeD with

  - SSB for L1-RSRP or L1-SINR measurement, or

  - another CSI-RS in resource set configured with repetition ON.

- For aperiodic CSI-RS resources as CMR 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 10.1.28.1 and 10.1.28.3 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 the value of P in FR2,

- P=1, when CSI-RS is not overlapped with measurement gap and also not overlapped with SMTC occasion.

- $P = \dfrac{1}{1 - \frac{T_{\text{CSI-RS}}}{\text{MRGP}}}$, when CSI-RS is partially overlapped with measurement gap and CSI-RS is not overlapped with SMTC occasion ($T_{\text{CSI-RS}} < \text{MGRP}$)

- $P=\dfrac{1}{1-\frac{T_{CSI-RS}}{T_{SMTCperiod}}}$, 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 ($T_{CSI-RS} = T_{SMTCperiod}$).

- $P=\dfrac{1}{1-\frac{T_{CSI-RS}}{MRGP}-\frac{T_{CSI-RS}}{T_{SMTCperiod}}}$, when CSI-RS is partially overlapped with measurement gap and CSI-RS is partially overlapped with SMTC occasion ($T_{CSI-RS} < T_{SMTCperiod}$) and SMTC occasion is not overlapped with measurement gap and

  - $T_{SMTCperiod} \neq MGRP$ or

  - $T_{SMTCperiod} = MGRP$ and $T_{CSI-RS} < 0.5*T_{SMTCperiod}$

- $P=\dfrac{3}{1-\frac{T_{CSI-RS}}{MRGP}}$, 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 $T_{CSI-RS} = 0.5*T_{SMTCperiod}$

- $P=\dfrac{1}{1-\frac{T_{CSI-RS}}{\min(T_{SMTCperiod},MGRP)}}$, 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.

- $P=\dfrac{3}{1-\frac{T_{CSI-RS}}{MRGP}}$, 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:

  $T_{SMTCperiod}$ = the configured SMTC1 period or SMTC2 period if configured.

  T_{CSI-RS} = the periodicity of CSI-RS configured for L1-SINR measurement

If the high layer in TS 38.331 [2] signalling 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-SINR measurement and SMTC means that CSI-RS for L1-SINR 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 7.7.6.0.1-1: Measurement period T$_{L1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_Only}$ for FR2

Configuration	T$_{L1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_Only}$ (ms)
non-DRX	max(T$_{Report}$, ceil(M*P*N)*T$_{CSI-RS}$)
DRX cycle ≤ 320ms	max(T$_{Report}$, ceil(1.5*M*P*N)*max(T$_{DRX}$,T$_{CSI-RS}$))
DRX cycle > 320ms	ceil(M*P*N)*T$_{DRX}$
Note 1:	T$_{CSI-RS}$ is the periodicity of CSI-RS configured for L1-SINR measurement. T$_{DRX}$ is the DRX cycle length. T$_{Report}$ is configured periodicity for reporting.
Note 2:	the requirements are applicable provided that the CSI-RS resource configured for L1-SINR measurement is transmitted with Density = 3.

The accuracy requirements in Table 7.7.6.0.1-3 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-SINR measurements are fulfilled according to Annex B.2.8.1 for a corresponding Band for each relevant CSI-RS based CMR.

- The bandwidth of CSI-RS as CMR 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].

- AWGN radio propagation conditions.

The performance with larger bandwidth of CSI-RS as CMR is equal to or better than the accuracy requirements in Table 7.7.6.0.1-3.

Table 7.7.6.0.1-3: L1-SINR absolute accuracy for CSI-RS based CMR only in FR2

Accuracy			Conditions			
Normal condition	**Extreme condition**	**CSI-RS CMR $\hat{E}s/Iot$ Note 3**	**Io Note 1 range**			
			Minimum Io			**Maximum Io**
dB	**dB**	**dB**	**dBm / SCS$_{CSI\text{-}RS}$ Note 2**		**dBm/BW$_{Channel}$**	**dBm/BW$_{Channel}$**
			SCS$_{CSI\text{-}RS}$ = 60kHz	SCS$_{CSI\text{-}RS}$ = 120kHz		
±5.5	±6.5	≥-3	Same value as CSI-RS_RP in Table in B.2.8.1, according to UE Power class, operating band and angle of arrival		N/A	-50
NOTE 1: Io 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 CMR $\hat{E}s/Iot$ and related parameters may need to be adjusted to ensure $\hat{E}s/Iot$ at UE baseband is above the value defined in this table.						

The normative reference for this requirement is TS 38.133 [6] clauses 9.8.4.1 and 10.1.28.1.

7.7.6.0.2   Minimum conformance requirements for SSB based CMR and dedicated IMR L1-SINR measurement accuracy

The UE shall be capable of performing L1-SINR measurements with the SSB configured as CMR and dedicated resource configured as IMR for L1-SINR computation, in which the NZP-CSI-RS or CSI-IM resource configured as dedicated IMR shall be 1-to-1 mapped to SSB configured as CMR, with the same periodicity. The UE physical layer shall be capable of reporting L1-SINR measured over the measurement period of $T_{L1\text{-}SINR\_Measurement\_Period\_SSB\_CMR\_IMR}$.

The requirements in this clause are not applicable if NZP-CSI-RS or CSI-IM resource configured as dedicated IMR is scheduled with different periodicity as SSB configured as CMR.

The value of $T_{L1\text{-}SINR\_Measurement\_Period\_SSB\_CMR\_IMR}$ is defined in Table 7.7.6.0.2-1 for FR2, where

For the value of M

- For periodic or semi-persistent NZP CSI-RS or CSI-IM resource as dedicated IMR, M=1 if the higher layer parameters *timeRestrictionForChannelMeasurements* and/or *timeRestrictionForInterferenceMeasurements* are configured, and M=3 otherwise;

For the value of N in FR2

- N = 8.

P is defined as the maximum value between P_{CMR} and P_{IMR}, i.e., $P = \max(P_{CMR}, P_{IMR})$, where

- the value of P_{CMR} shall be derived in the same way as the value of P used for SSB based L1-RSRP measurement in clause 9.5.4.1, in which the occasions and period of the SSB for CMR shall be used instead.

- the value of P_{IMR} shall be derived in the same way as the value of P used for CSI-RS based L1-RSRP measurement in clause 9.5.4.2, in which the occasions and period of the NZP CSI-RS for NZP-IMR or CSI-IM for ZP-IMR shall be used instead.

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

For L1-SINR measurement with SSB as CMR and CSI-RS or CSI-IM as IMR, the requirement shall apply if the CSI-RS is configured as IMR with repetition field as "repetition = OFF" or CSI-IM is configured as IMR.

For L1-SINR measurement with SSB as CMR and CSI-RS/CSI-IM as IMR, no requirement shall apply if SSB occasions for CMR or CSI-RS/CSI-IM occasions for IMR are fully overlapped with the configured measurement gap

Table 7.7.6.0.2-1: Measurement period $T_{L1\text{-}SINR\_Measurement\_Period\_SSB\_CMR\_IMR}$ for FR2

Configuration	$T_{L1\text{-}SINR\_Measurement\_Period\_SSB\_CMR\_IMR}$ (ms)
non-DRX	$\max(T_{Report}, \text{ceil}(M*P*N)*T_{SSB})$
DRX cycle $\leq$ 320ms	$\max(T_{Report}, \text{ceil}(1.5*M*P*N)*\max(T_{DRX},T_{SSB}))$
DRX cycle > 320ms	$\text{ceil}(1.5*M*P*N)*T_{DRX}$
Note 1:	T_{SSB} = ssb-periodicityServingCell is the periodicity of the SSB-Index configured for L1-SINR measurement. T_{DRX} is the DRX cycle length. T_{Report} is configured periodicity for reporting.
Note 2:	The requirements are applicable provided that the CSI-RS resource configured for interference measurement shall be 1-to-1 mapped to SSB configured for channel measurement, with the same periodicity.

The accuracy requirements in Tables 7.7.6.0.2-2 and 7.7.6.0.2-3 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-SINR measurements are fulfilled according to Annex B.2.8.2 for a corresponding Band for each relevant SSB based CMR and IMR.

- The bandwidth of NZP-IMR and ZP-IMR 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].

- AWGN radio propagation conditions.

- SSB based CMR and IMR in the test come from the same direction.

The performance with larger bandwidth of NZP-IMR and ZP-IMR is equal to or better than the accuracy requirements in Tables 7.7.6.0.2-2 and 7.7.6.0.2-3.

Table 7.7.6.0.2-2: L1-SINR absolute accuracy for SSB based CMR and NZP-IMR in FR2

Accuracy				Conditions		
Normal condition	Extreme condition	SSB CMR Ês/Iot Note 3	NZP-IMR Ês/Iot Note 3	Io Note 1 range		
					Minimum Io	Maximum Io
dB	dB	dB	dB	dBm / SCS$_{SSB}$ Note 2	dBm/BW$_{Channel}$	dBm/BW$_{Channel}$
				SCS$_{SSB}$ = 120kHz	SCS$_{SSB}$ = 240kHz		
±4.0	±5.0	≥0	≥0	Same value as SSB_RP in Table in B.2.8.2, according to UE Power class, operating band and angle of arrival	N/A	-50
NOTE 1:	Io 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 SSB Ês/Iot, NZP-IMR Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.					

Table 7.7.6.0.2-3: L1-SINR absolute accuracy for SSB based CMR and ZP-IMR in FR2

Accuracy			Conditions			
Normal condition	Extreme condition	SSB CMR Ês/Iot [Note 3]	Io [Note 1] range			
			Minimum Io			Maximum Io
dB	dB	dB	dBm / SCS$_{SSB}$ [Note 2]		dBm/BW$_{Channel}$	dBm/BW$_{Channel}$
			SCS$_{SSB}$ = 120kHz	SCS$_{SSB}$ = 240kHz		
±4.5	±5.5	≥-3	Same value as SSB_RP in Table in B.2.8.2, according to UE Power class, operating band and angle of arrival		N/A	-50
NOTE 1: Io 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 SSB CMR Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.						

The normative reference for this requirement is TS 38.133 [6] clauses 9.8.4.2 and 10.1.28.2.

7.7.6.0.3 Minimum conformance requirements for CSI-RS based CMR and dedicated IMR L1-SINR measurement accuracy

The UE shall be capable of performing L1-SINR measurements with the CSI-RS resource configured as CMR and dedicated resource configured as IMR for L1-SINR computation, in which the NZP-CSI-RS or CSI-IM resource configured as dedicated IMR shall be 1-to-1 mapped to CSI-RS resource configured as CMR, with the same periodicity. The UE physical layer shall be capable of reporting L1-SINR measured over the measurement period of $T_{L1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_IMR}$.

The requirements in this clause are not applicable if NZP-CSI-RS or CSI-IM resource configured as dedicated IMR is scheduled with different periodicity as CSI-RS resource configured as CMR.

The value of $T_{L1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_IMR}$ is defined in Table 7.7.6.0.3-2 for FR2, where

For the value of M,

- M=1 shall be applied if

    - aperiodic NZP-CSI-RS as CMR or dedicated IMR, or

    - aperiodic CSI-IMR as dedicated IMR, or

    - periodic and semi-persistent NZP-CSI-RS as CMR or dedicated IMR and the higher layer parameters *timeRestrictionForChannelMeasurement* and/or *timeRestrictionForInterferenceMeasurements* are configured, or

    - periodic and semi-persistent CSI-IM as dedicated IMR and the higher layer parameters *timeRestrictionForChannelMeasurement* and/or *timeRestrictionForInterferenceMeasurements* are configured;

- M=3 otherwise.

For the value of N in FR2

- For periodic CSI-RS resources as CMR 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 or L1-SINR measurement, or

    - another CSI-RS in resource set configured with repetition ON.

- For periodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / $N_{res\_per\_set}$), where $N_{res\_per\_set}$ 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 as CMR 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 has QCL-TypeD with

  - SSB for L1-RSRP or L1-SINR measurement, or

  - another CSI-RS in resource set configured with repetition ON.

- For semi-persistent CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / $N_{res\_per\_set}$), where $N_{res\_per\_set}$ 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 as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided *qcl-info* is configured for all resources in the resource set and for each resource has QCL-TypeD with

  - SSB for L1-RSRP or L1-SINR measurement, or

  - another CSI-RS in resource set configured with repetition ON.

- For aperiodic CSI-RS resources as CMR 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 10.1.28.1 and 10.1.28.3 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.

P is defined as the maximum value between P_{CMR} and P_{IMR}, i.e., $P = max(P_{CMR}, P_{IMR})$, where

- The value of P_{CMR} and P_{IMR} shall be derived in the same way as the value of P used for CSI-RS based L1-RSRP measurement in clause 9.5.4.2, in which the occasions and period of the CSI-RS for CMR and NZP CSI-RS for NZP-IMR or CSI-IM for ZP-IMR shall be used instead respectively.

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

For L1-SINR measurement with CSI-RS as CMR and CSI-RS as IMR, the requirement shall apply only if CSI-RS resources as CMR and IMR are configured with the same repetition field and the number of CSI-RS resources in the resource sets for CMR and IMR are same.

For L1-SINR measurement with CSI-RS as CMR and CSI-IM as IMR, the requirement shall apply only if the number of CSI-RS resources in the resource set for CMR and the number of CSI-IM resources in the resource set for IMR are same.

For L1-SINR measurement with CSI-RS as CMR and CSI-RS/CSI-IM as IMR, no requirement shall apply if CSI-RS occasions for CMR or CSI-RS/CSI-IM occasions for IMR are fully overlapped with the configured measurement gap.

Table 7.7.6.0.3-1: Measurement period $T_{L1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_IMR}$ for FR2

Configuration	$T_{L1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_IMR}$ (ms)
non-DRX	$max(T_{Report}, ceil(M*P*N)*T_{CSI-RS})$
DRX cycle ≤ 320ms	$max(T_{Report}, ceil(1.5*M*P*N)*max(T_{DRX}, T_{CSI-RS}))$
DRX cycle > 320ms	$ceil(M*P*N)*T_{DRX}$
Note 1: T_{CSI-RS} is the periodicity of CSI-RS configured for L1-SINR measurement. T_{DRX} is the DRX cycle length. T_{Report} is configured periodicity for reporting.	
Note 2: the requirements are applicable provided that the CSI-RS resource configured for L1-SINR measurement is transmitted with Density = 3.	
Note 3: The requirements are applicable provided that the CSI-RS resource configured for interference measurement shall be 1-to-1 mapped to CSI-RS configured for channel measurement, with the same periodicity.	

The accuracy requirements in Tables 7.7.6.0.3-2 and 7.7.6.0.3-3 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-SINR measurements are fulfilled according to Annex B.2.8.3 for a corresponding Band for each relevant CSI-RS based CMR and IMR.

- The bandwidth of CSI-RS as CMR, NZP-IMR and ZP-IMR 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].

- AWGN radio propagation conditions.

- CSI-RS based CMR and IMR in the test come from the same direction.

The performance with larger bandwidth of CSI-RS as CMR, NZP-IMR and ZP-IMR is equal to or better than the accuracy requirements in Tables 7.7.6.0.3-2 and 7.7.6.0.3-3.

Table 7.7.6.0.3-2: L1-SINR absolute accuracy for CSI-RS based CMR and NZP-IMR in FR2

Accuracy				Conditions			
Normal condition	Extreme condition	CSI-RS CMR Ês/Iot Note 3	NZP-IMR Ês/Iot Note 3	Io [Note 1] range			
					Minimum Io		Maximum Io
dB	dB	dB	dB	dBm / SCS_{CSI-RS} [Note 2]		dBm/$BW_{Channel}$	dBm/$BW_{Channel}$
				SCS_{CSI-RS} = 60kHz	SCS_{CSI-RS} = 120kHz		
±4.0	±5.0	≥0	≥0	Same value as CSI-RS_RP in Table in B.2.8.3, according to UE Power class, operating band and angle of arrival		N/A	-50
NOTE 1: Io 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/Iot, NZP-IMR Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.							

Table 7.7.6.0.3-3: L1-SINR absolute accuracy for CSI-RS based CMR and ZP-IMR in FR2

Accuracy			Conditions			
Normal condition	Extreme condition	CSI-RS CMR Ês/Iot Note 3	Io [Note 1] range			
				Minimum Io		Maximum Io
dB	dB	dB	dBm / SCS_{CSI-RS} [Note 2]		dBm/$BW_{Channel}$	dBm/$BW_{Channel}$
			SCS_{CSI-RS} = 60kHz	SCS_{CSI-RS} = 120kHz		
±4.5	±5.5	≥-3	Same value as CSI-RS_RP in Table in B.2.8.3, according to UE Power class, operating band and angle of arrival		N/A	-50
NOTE 1: Io 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/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.						

The normative reference for this requirement is TS 38.133 [6] clauses 9.8.4.3 and 10.1.28.3.

7.7.6.1 NR SA FR2 CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off L1-SINR measurement accuracy

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

- The test is incomplete for test frequencies > 40.8 GHz

- This test case does not check absolute L1-SINR test requirement for weaker CSI-RS even when it is stated in TS 38.133. L1-SINR reports defined in TS 38.214 do not include absolute L1-SINR value for weaker CSI-RS

7.7.6.1.1 Test purpose

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits.

7.7.6.1.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards. Applicability requires support of L1-SINR measurements.

7.7.6.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.6.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.6.1.

7.7.6.1.4 Test description

7.7.6.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.6.1.4.1-1.

Table 7.7.6.1.4.1-1: Applicable NR configurations for FR2 L1-SINR test with CSI-RS based CMR and no dedicated IMR configured

Config	Description
1	NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode

Configure the test equipment and the DUT according to the parameters in Table 7.7.6.1.4.1-2.

Table 7.7.6.1.4.1-2: Initial conditions for CSI-RS based L1-SINR absolute accuracy in FR2

Parameter	Value	Comment
Test environment	NC	As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1.	
Channel bandwidth	As specified by the selected test configuration.	
Propagation conditions	AWGN	As specified in Annex C.2.1
Connection Diagram	TE Part: A.3.3.1.1 DUT Part: A.3.4.1.1	As specified in TS 38.508-1 [14] Annex A.
Exceptions to connection diagram	N/A	

1. Message contents are defined in clause 7.7.6.1.4.3.

2. Cell 1 is the NR FR2 cell. Cell 1 is the target cell for the CSI-RS based L1-SINR measurements. The UE is configured to perform RLM and BFD measurement based on the CSI-RS.

3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

7.7.6.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 7.7.6.1.4.1-2.

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

2. Set the parameters according to T1 in Table 7.7.6.1.5-1.

3. After 640ms from the start of the test the SS transmits CSI-RS with a periodicity of 20 slots.

4. The SS shall check following requirements:

   - R1:   the L1-SINR reported values of CSI-RS#0 and CSI-RS#1 in the periodic L1-RSRP reports. If the value for both CSI-RSs is within the limits in Table 7.7.6.1.5-2 or Table 7.7.6.1.5-3 (depending on the test configuration), the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

   - R2:   the L1-SINR value of CSI-RS#1 reported by the UE is compared to the expected L1-SINR value for CSI-RS#1. If the resulting value is outside the limits in Table 7.7.6.1.5-4 or the UE fails to report the measurement value for CSI-RS#1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

   - R3:   the DIFF SINR value of CSI-RS#0 reported by the UE is compared to the expected DIFF SINR value. If the resulting value is outside the limits in Table 7.7.6.1.5-4 or the UE fails to report the measurement value for CSI-RS#0, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

5. The SS shall continue checking the L1-SINR report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to each sub-test in Table 7.7.6.1.5-1 as appropriate and repeat steps 3-5.

7.7.6.1.4.3 Message contents

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

Table 7.7.6.1.4.3-1: Common Exception messages NR SA CSI-RS-based L1-RSRP measurement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.6A-1 with conditions PERIODIC and CSI-SINR Table H.3.6A-2 with conditions CSI-RS and PERIODIC Table H.3.6A-3 with condition PERIODIC Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 7.7.6.1.4.3-2: RadioLinkMonitoringConfig

Information Element	Value/remark	Comment	Condition
Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSB.	
}			
}			

7.7.6.1.5 Test requirement

Table 7.7.6.1.5-1 defines the primary level settings excluding test tolerances for all tests. (Refer to Sec. 7.7.3.1.5)

Each L1-SINR measurement report for each of the tests in Table 7.7.6.1.5-1 shall meet the corresponding absolute accuracy requirements in Table 7.7.6.1.5-2 for test configurations 1 and 2, and the corresponding absolute accuracy requirements in Table 7.7.6.1.5-3 for test configuration 3.

Table 7.7.6.1.5-1: FR2 CSI-RS based L1-SINR general test parameters

Parameter	Config	Unit	Test 1
SSB GSCN	1		freq1
Duplex mode	1		TDD
TDD Configuration	1		TDDConf.3.1
BW$_{channel}$	1	MHz	100: N$_{RB,c}$ = 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
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
TRS Configuration	1		TRS.2.1 TDD
PDCCH/PDSCH TCI Configuration	1		TCI.State.2
SMTC configuration	1		SMTC.1
CSI-RS	1		CSI-RS.3.2 TDD
reportConfigType	1		periodic
reportQuantity	1		cri-SINR-r16
nrofReportedRS	1		2
L1-SINR reporting period	1		slot80
Propagation condition	1		AWGN
Antenna configuration	1		1x2
EPRE ratio of PSS to SSS	1	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS[Note 1]			
EPRE ratio of OCNG to OCNG DMRS [Note 1]			
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.			

Table 7.7.6.1.5-2: FR2 CSI-RS based L1-SINR OTA related test parameters

Parameter	Config	Unit	Test 1	
			CSI-RS0	**CSI-RS1**
Angle of arrival configuration			Setup 1 according to A.3.15.1	
Assumption for UE beams[Note 4]			Rough	
N_{oc}	1~2	dBm/15 kHz	-104.1	
N_{oc}	1~2	dBm/SSB SCS	-95.1	
$\hat{E}_s/I_{ot}$	1~2	dB	10	-1.8
CSI-RS-RSRP[Note1]	1~2	dBm/SCS	-85.07	-96.87
Io[Note1]	1~2	dBm/ 95.04MHz	-55.67	-63.88
$\hat{E}_s/N_{oc}$	1~2	dB	10	-1.8
Note 1: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. Note 3: Void. Note 4: Information about types of UE beam is given in TS 38.133 Annex B.2.1.3, and does not limit UE implementation or test system implementation				

After 640ms from the beginning of the test, the L1-SINR measurement accuracy for CSI-RS#0 and CSI-RS#1 of Cell 1 shall meet the corresponding absolute accuracy requirements in Table 7.7.6.1.5-3 and the corresponding relative accuracy requirements in Table 7.7.6.1.5-4.

Table 7.7.6.1.5-3: L1-SINR absolute accuracy requirements for the reported values

UE power class 3	
Normal Conditions	**Test 1 All bands**
Lowest reported value (CSI-RS0)	53
Highest reported value (CSI-RS0)	76
Extreme Conditions	**Test 1 All bands**
Lowest reported value (CSI-RS0)	51
Highest reported value (CSI-RS0)	78

Table 7.7.6.1.5-4: L1-SINR relative accuracy requirements for the reported values

UE power class 3	
Normal Conditions	**Test 1 All bands**
Lowest DIFF SINR reported value	6
Highest DIFF SINR reported value	15
Extreme Conditions	**Test 1 All bands**
Lowest DIFF SINR reported value	5
Highest DIFF SINR reported value	15

For the test to pass, the ratio of successful reported values for each requirement shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

7.7.6.2 NR SA FR2 SSB based CMR and dedicated IMR L1-SINR measurement accuracy

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

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

- This test case does not check absolute L1-SINR test requirement for weaker CSI-RS even when it is stated in TS 38.133. L1-SINR reports defined in TS 38.214 do not include absolute L1-SINR value for weaker CSI-RS

7.7.6.2.1 Test purpose

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits.

7.7.6.2.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards. Applicability requires support of L1-SINR measurements.

7.7.6.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.6.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.6.2.

7.7.6.2.4 Test description

7.7.6.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.6.2.4.1-1.

Table 7.7.6.2.4.1-1: Applicable NR configurations for FR2 L1-SINR measurement test with SSB based CMR and CSI-IM based IMR

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 required to be tested in one of the supported test configurations in each supported band

Configure the test equipment and the DUT according to the parameters in Table 7.7.6.2.4.1-2.

Table 7.7.6.2.4.1-2: Initial conditions for SSB based L1-SINR absolute accuracy in FR2

Parameter	Value	Comment
Test environment	NC	As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1.	
Channel bandwidth	As specified by the test configuration selected from Table 7.7.6.2.4.1-1.	
Propagation conditions	AWGN	As specified in Annex C.2.1
Connection Diagram	TE Part: A.3.3.1.1 DUT Part: A.3.4.1.1	As specified in TS 38.508-1 [14] Annex A.
Exceptions to connection diagram	N/A	

1. Message contents are defined in clause 7.7.6.2.4.3.

2. Cell 1 is the NR FR2 cell. Cell 1 is the target cell for the SSB-based L1-RSRP measurements. The UE is configured one SSB resource set with two SSB resources and one CSI-IM resource set with two CSI-IM resource. UE is configured to perform RLM and BFD measurement based on the SSB resources 0 and 1. UE is configured to perform L1-SINR measurement based on the SSBs as CMR and the CSI-IM resources as IMR..

3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

7.7.6.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 7.7.6.2.4.1-2.

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

2. Set the parameters according to T1 in Table 7.7.6.2.5-1.

3. After 640ms from the start of the test the SS transmits CSI-RS as IMR with a periodicity of 20 slots.

4. The SS shall check following requirements:

   - R1: the L1-SINR reported values of SSB#0+CSI-IM#0 and SSB#1+CSI-IM#1 in the periodic L1-RSRP reports. If the value for both SSB#0+CSI-IM#0 and SSB#1+CSI-IM#1 is within the limits in Table 7.7.6.2.5-2 and Table 7.7.6.2.5-3 (depending on the test configuration), the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

   - R2: the L1-SINR value of SSB#1 reported by the UE is compared to the expected L1-SINR value for SSB#1. If the resulting value is outside the limits in Table 7.7.6.2.5-4 or the UE fails to report the measurement value for SSB#1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

   - R3: the DIFF SINR value of SSB#0 reported by the UE is compared to the expected DIFF SINR value. If the resulting value is outside the limits in Table 7.7.6.2.5-4 or the UE fails to report the measurement value for SSB#0, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

5. The SS shall continue checking the L1-SINR report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to each sub-test in Table 7.7.6.2.5-1 as appropriate and repeat steps 3-5.

7.7.6.2.4.3 Message contents

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

Table 7.7.6.2.4.3-1: Common Exception messages NR SA SSB based L1-RSRP measurement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.6A-1 with conditions PERIODIC and SS-SINR and CSI-RS_IMR Table H.3.6A-2 with conditions SSB and PERIODIC Table H.3.6A-3 with condition PERIODIC Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 7.7.6.2.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSBs.	
detectionResource CHOICE {			
ssb-Index	0		
}			
}			
}			

7.7.6.2.5 Test requirement

Table 7.7.6.2.5-1 defines the primary level settings including test tolerances for all tests.

Each L1-RSRP measurement report for each of the tests in Table 7.7.6.2.5-1 shall meet the corresponding absolute accuracy requirements in Table 7.7.6.2.5-2 for test configurations 1 and 2, and the corresponding absolute accuracy requirements in Table 7.7.6.2.5-3 for test configuration 3.

Table 7.7.6.2.5-1: FR2 L1-SINR general test parameters with SSB based CMR and CSI-IM based IMR

Parameter	Config	Unit	Test 1
SSB GSCN	1~2		freq1
Duplex mode	1~2		TDD
TDD Configuration	1~2		TDDConf.3.1
BW$_{channel}$	1~2	MHz	100: N$_{RB,c}$ = 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
CSI-IM configuration	1~2		CSI-IM 3.1 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
TRS Configuration	1~2		TRS.2.1 TDD
PDCCH/PDSCH TCI Configuration	1~2		TCI.State.2
SMTC configuration	1~2		SMTC.1
reportConfigType	1~2		periodic
reportQuantity-r16	1~2		ssb-Index-SINR-r16
Number of reported RS	1~2		2
L1-SINR reporting period	1~2		slot640
Propagation condition	1~2		AWGN
Antenna configuration	1~2		1x2
EPRE ratio of PSS to SSS	1~2	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS$^{Note\ 1}$			
EPRE ratio of OCNG to OCNG DMRS $^{Note\ 1}$			
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.			

Table 7.7.6.2.5-2: FR2 L1-SINR SSB specific test parameters

Parameter	Config	Unit	Test 1	
			SSB0	**SSB1**
Angle of arrival configuration			Setup 1 according to A.3.15.1	
Assumption for UE beams[Note 4]			Rough	
N_{oc}	1~2	dBm/15kHz	-104.1	
N_{oc}	1	dBm/SSB SCS	-95.1	
	2		92.1	
$\hat{E}_s/I_{ot}$	1~2	dB	10	1.8
SS-RSRP[Note1]	1	dBm/SCS	-85.07	-96.87
	2		-82.06	-93.86
Io[Note1]	1~2	dBm/95.04 MHz	-55.67	
$\hat{E}_s/N_{oc}$	1~2	dB	10	-1.8
Note 1: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.				
Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.				
Note 3: Information about types of UE beam is given in TS 38.133 Annex B.2.1.3, and does not limit UE implementation or test system implementation				

After 640ms from the beginning of the test, the L1-SINR measurement accuracy for SSB#0+CSI-IM#0 and SSB#1+CSI-IM#1 of Cell 1 shall meet the corresponding absolute accuracy of SSB#0+CSI-IM#0 and absolute accuracy of SSB#1+CSI-IM#1 in Table 7.7.6.2.5-3. The corresponding relative accuracy requirements in Table 7.7.6.2.5-4

Table 7.7.6.2.5-3: L1-SINR absolute accuracy test requirement

UE power class 3	
Normal Conditions	**Test 1 All bands**
Lowest reported value (CSI-RS0)	55
Highest reported value (CSI-RS0)	74
Extreme Conditions	**Test 1 All bands**
Lowest reported value (CSI-RS0)	53
Highest reported value (CSI-RS0)	76

Table 7.7.6.2.5-4: L1-SINR relative accuracy requirements for the reported values

UE power class 3	
Normal Conditions	**Test 1 All bands**
Lowest DIFF SINR reported value	7
Highest DIFF SINR reported value	15
Extreme Conditions	**Test 1 All bands**
Lowest DIFF SINR reported value	6
Highest DIFF SINR reported value	15

For the test to pass, the ratio of successful reported values for each requirement shall be more than 90% with a confidence level of 95%. Each requirement is evaluated independently of the others.

7.7.6.3 NR SA FR2 CSI-RS based CMR and dedicated IMR L1-SINR measurement accuracy

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

- The test is incomplete for UE power classes other than PC3

- The test is incomplete for test frequencies > 40.8 GHz

- The test is incomplete for extreme conditions

- This test case does not check absolute L1-SINR test requirement for weaker CSI-RS even when it is stated in TS 38.133. L1-SINR reports defined in TS 38.214 do not include absolute L1-SINR value for weaker CSI-RS

7.7.6.3.1 Test purpose

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits.

7.7.6.3.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards. Applicability requires support of L1-SINR measurements.

7.7.6.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 7.7.6.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.7.7.6.3.

7.7.6.3.4 Test description

7.7.6.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 7.7.6.3.4.1-1.

Table 7.7.6.3.4.1-1: Applicable NR configurations for FR2 L1-SINR measurement test with CSI-RS based both CMR based IMR

Config	Description
1	NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode

Configure the test equipment and the DUT according to the parameters in Table 7.7.6.3.4.1-2.

Table 7.7.6.3.4.1-2: Initial conditions for CSI-RS based L1-SINR absolute accuracy in FR2

Parameter	Value	Comment
Test environment	NC	As specified in TS 36.508 [25] clause 4.1.
Test frequencies	As specified in Annex E, Table E.5-1 and TS 38.508-1 [14] clause 4.3.1.	
Channel bandwidth	As specified by the test configuration selected from Table 7.7.6.3.4.1-1.	
Propagation conditions	AWGN	As specified in Annex C.2.1
Connection Diagram	TE Part: A.3.3.1.1 DUT Part: A.3.4.1.1	As specified in TS 38.508-1 [14] Annex A.
Exceptions to connection diagram	N/A	

1. Message contents are defined in clause 7.7.6.3.4.3.

2. Cell 1 is the NR FR2 cell. Cell 1 is the target cell for the SSB-based L1-RSRP measurements. The UE is configured configured two CSI-RS resource sets with two CSI-RS resources for each set. 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. UE is configured to perform L1-SINR measurement based on the configured CSI-RS as both CMR and IMR.

3. The UE Rx beam peak direction has been obtained previously using one of the Rx Beam Peak Search procedures as described in Annex I.

7.7.6.3.4.2   Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to PSCell. The UE shall be configured for periodic CSI reporting in PUCCH [format 2] with a reporting periodicity as mentioned in the above table 7.7.6.3.4.1-2.

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

2. Set the parameters according to T1 in Table 7.7.6.3.5-1.

3. After 640ms from the start of the test the SS transmits CSI-RS as IMR with a periodicity of 20 slots.

4. The SS shall check following requirements:

   - R1:   the L1-SINR reported values of CSI-RS#0+CSI-IM#0 and CSI-RS#1+CSI-IM#1 in the periodic L1-RSRP reports. If the value for both CSI-RS#0+CSI-IM#0 and CSI-RS#1+CSI-IM#1 is within the limits in Table 7.7.6.3.5-2 and Table 7.7.6.3.5-3 (depending on the test configuration), the number of passed iterations is increased by one, otherwise the number of failed iterations is increased by one.

   - R2:   the L1-SINR value of CSI-RS#1 reported by the UE is compared to the expected L1-SINR value for CSI-RS #1. If the resulting value is outside the limits in Table 7.7.6.3.5-2 or the UE fails to report the measurement value for CSI-RS #1, the number of failed iterations for R2 is increased by one. Otherwise, the number of passed iterations for R2 is increased by one.

   -R3:   The DIFF SINR value of CSI-RS #0 reported by the UE is compared to the expected DIFF SINR value. If the resulting value is outside the limits in Table 7.7.6.3.5-3 or the UE fails to report the measurement value for CSI-RS #0, the number of failed iterations for R3 is increased by one. Otherwise, the number of passed iterations for R3 is increased by one.

5. The SS shall continue checking the L1-SINR report messages transmitted by the UE until the confidence level according to Table G.2.3-1 in Annex G is achieved.

6. Set the parameters according to each sub-test in Table 7.7.6.3.5-1 as appropriate and repeat steps 3-5.

7.7.6.3.4.3   Message contents

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

Table 7.7.6.3.4.3-1: Common Exception messages NR SA CSI-RS-based L1-RSRP measurement

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.6A-1 with conditions PERIODIC and CSI-SINR Table H.3.6A-2 with conditions CSI-RS and PERIODIC Table H.3.6A-3 with condition PERIODIC Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 7.7.6.3.4.3-2: RadioLinkMonitoringConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-133			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioLinkMonitoringConfig ::= SEQUENCE {			
failureDetectionResourcesToAddModList SEQUENCE (SIZE(1..maxNrofFailureDetectionResources)) OF SEQUENCE {	1 entry		
purpose	both	UE is configured to perform RLM and BFD based on the SSB.	
}			
}			

7.7.6.3.5 Test requirement

Table 7.7.6.3.5-1 defines the primary level settings excluding test tolerances for all tests.

Each L1-SINR measurement report for each of the tests in Table 7.7.6.3.5-1 shall meet the corresponding absolute accuracy requirements in Table 7.7.6.3.5-2 for test configurations 1 and 2, and the corresponding absolute accuracy requirements in Table 7.7.6.3.5-3 for test configuration 3.

Table 7.7.6.3.5-1: FR2 L1-SINR measurement test with CSI-RS based both CMR and IMR

Parameter	Config	Unit	Test 1
SSB GSCN	1		freq1
Duplex mode	1		TDD
TDD Configuration	1		TDDConf.3.1
BW$_{channel}$	1	MHz	100: N$_{RB,c}$ = 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
OCNG Patterns	1		OP.1
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
PDCCH/PDSCH TCI Configuration	1		TCI.State.2
SMTC configuration	1		SMTC.1
CSI-RS configuration as CMR	1		CSI-RS.3.2 TDD
CSI-RS configuration as IMR	1		CSI-RS.3.3A TDD
reportConfigType	1		periodic
reportQuantity-r16	1		cri-SINR-r16
nrofReportedRS	1		2
L1-RSRP reporting period	1		slot80
Propagation condition	1		AWGN
Antenna configuration	1		1x2
EPRE ratio of PSS to SSS	1	dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DMRS to SSS			
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH DMRS			
EPRE ratio of OCNG DMRS to SSS[Note 1]			
EPRE ratio of OCNG to OCNG DMRS [Note 1]			
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.			

Table 7.7.6.3.5-2: FR2 CSI-RS based L1-SINR measurement OTA related test parameters

Parameter	Config	Unit	Test 1	
			CSI-RS0	CSI-RS1
Angle of arrival configuration			Setup 1 according to A.3.15.1	
Assumption for UE beams[Note 4]			Rough	
N_{oc}	1~2	dBm/15 kHz	-104.1	
N_{oc}	1~2	dBm/SSB SCS	-95.1	
$\hat{E}_s/I_{ot}$	1~2	dB	10	0.2
CSI-RS-RSRP[Note1]	1~2	dBm/SCS	-85.07	-94.87
Io[Note1]	1~2	dBm/95.04MHz	-55.67	-62.97
$\hat{E}_s/N_{oc}$	1~2	dB	10	0.2
Note 1: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.				
Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.				
Note 3: No additional noise is added by the test system in Test 2.				
Note 4: Information about types of UE beam is given in TS 38.133 Annex B.2.1.3, and does not limit UE implementation or test system implementation				

After 640ms from the beginning of the test, the L1-SINR measurement accuracy for CSI-RS#0+CSI-RS#2 and CSI-RS#1+CSI-RS#3 of Cell 1 shall meet the corresponding absolute accuracy of CSI-RS#0 and absolute accuracy of CSI-RS#1 in Table 7.7.6.3.5-3. The corresponding relative accuracy of CSI-RS#0 compared with CSI-RS#1 in Table 7.7.6.3.5-4.

Table 7.7.6.3.5-3: L1-SINR absolute accuracy test requirement

UE power class 3	
Normal Conditions	**Test 1 All bands**
Lowest reported value (CSI-RS0)	55
Highest reported value (CSI-RS0)	74
Extreme Conditions	**Test 1 All bands**
Lowest reported value (CSI-RS0)	53
Highest reported value (CSI-RS0)	76

Table 7.7.6.3.5-4: L1-SINR relative accuracy test requirement for the reported values

UE power class 3	
Normal Conditions	**Test 1 All bands**
Lowest DIFF SINR reported value	5
Highest DIFF SINR reported value	13
Extreme Conditions	**Test 1 All bands**
Lowest DIFF SINR reported value	4
Highest DIFF SINR reported value	14