6 NR standalone in FR1

6.0 General

This clause contains test scenarios for NR standalone. This configuration is also known as NR/5GC. All NR cells are in Frequency Range 1.

6.1 RRC_IDLE state mobility

6.1.1 NR cell re-selection

6.1.1.0 Minimum conformance requirements

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

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

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

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

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

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

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

The UE shall be able to evaluate whether a newly detectable inter-frequency cell meets the reselection criteria defined in TS38.304 [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 clause shall still be met by the UE before it makes any determination that it may stop measuring the cell. If the UE detects on a NR carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE shall measure SS-RSRP or SS-RSRQ at least every $K_{carrier} * T_{measure,NR\_Inter}$ (see table 4.2.2.4-1 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, and

- SMTC occasions configured for the inter-frequency carrier occur up to 1 ms before the start or up to TBD ms after the end of the SMTC occasions configured for the intra-frequency carrier, and

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

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

6.1.1.0.3 Minimum conformance requirements for intra-frequency cell re-selection for UE configured with highSpeedMeasFlag-r16

The cell re-selection delay shall be less than $T_{\text{evaluate NR\_Intra}} + T_{\text{SI-NR}}$ 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 $T_{\text{detect,NR\_Intra}}$ as defined in table 4.2.2.3-2 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 $T_{\text{measure,NR\_Intra}}$ (see table 4.2.2.3-2 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 $T_{\text{measure,NR\_Intra}}/2$.

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

For an intra-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the intra-frequency cell has met reselection criterion defined within $T_{\text{evaluate,NR\_Intra}}$ when $T_{\text{reselection}} = 0$ as specified in table 4.2.2.3-2 of TS 38.133 [6] provided that the cell has at least 3dB better ranked.

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

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

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

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

[TS 38.133, clause 4.2.2.3]

An intra frequency cell is considered to be detectable according to the conditions defined in Annex B.1.2 for a corresponding Band.

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

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

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

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

when *rangeToBestCell* is not configured:

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

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

[TS 38.133, clause 4.2.2.9.2]

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

- UE is configured with *lowMobilityEvalutation* [2] criterion and UE has fulfilled, or

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

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

- T_{detect,NR_Intra} as specified in Table 4.2.2.9.2-1.

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

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

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

DRX cycle length [s]	Scaling Factor (N1)		T_{detect,NR_Intra} [s] (number of DRX cycles)	$T_{measure,NR\_Intra}$ [s] (number of DRX cycles)	$T_{evaluate,NR\_Intra}$ [s] (number of DRX cycles)
	FR1	FR2[Note1]			
0.32	1	8	11.52 x N1 x M2 x K1 (36 x N1 x M2 x K1)	1.28 x N1 x M2 x K1 (4 x N1 x M2 x K1)	5.12 x N1 x M2 x K1 (16 x N1 x M2 x K1)
0.64		5	17.92 x N1 x K1 (28 x N1 x K1)	1.28 x N1 x K1 (2 x N1 x K1)	5.12 x N1 x K1 (8 x N1 x K1)
1.28		4	32 x N1 x K1 (25 x N1 x K1)	1.28 x N1 x K1 (1 x N1 x K1)	6.4 x N1 x K1 (5 x N1 x K1)
2.56		3	58.88 x N1 x K1 (23 x N1 x K1)	2.56 x N1 x K1 (1 x N1 x K1)	7.68 x N1 x K1 (3 x N1 x K1)
Note 1: Applies for UE supporting power class 2&3&4. For UE supporting power class 1, N1 = 8 for all DRX cycle length.					
Note 2: M2 = 1.5 if SMTC periodicity of measured intra-frequency cell > 20 ms; otherwise M2=1.					
Note 3: K1 = 3 is the measurement relaxation factor applicable for UE fulfilling the *lowMobilityEvalutation* [13] criterion.					

[TS 38.133, clause 4.2.2.9.3]

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

- UE is configured with *cellEdgeEvaluation* [2] criterion and UE has fulfilled, or

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

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

- T_{detect,NR_Intra} as specified in Table 4.2.2.9.3-1.

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

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

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

DRX cycle length [s]	Scaling Factor (N1)		T_{detect,NR_Intra} [s] (number of DRX cycles)	$T_{measure,NR\_Intra}$ [s] (number of DRX cycles)	$T_{evaluate,NR\_Intra}$ [s] (number of DRX cycles)
	FR1	FR2 [Note1]			
0.32	1	8	11.52 x N1 x M2 x K1 (36 x N1 x M2 x K1)	1.28 x N1 x M2 x K1 (4 x N1 x M2 x K1)	5.12 x N1 x M2 x K1 (16 x N1 x M2 x K1)
0.64		5	17.92 x N1 x K1 (28 x N1 x K1)	1.28 x N1 x K1 (2 x N1 x K1)	5.12 x N1 x K1 (8 x N1 x K1)
1.28		4	32 x N1 x K1 (25 x N1 x K1)	1.28 x N1 x K1 (1 x N1 x K1)	6.4 x N1 x K1 (5 x N1 x K1)
2.56		3	58.88 x N1 x K1 (23 x N1 x K1)	2.56 x N1 x K1 (1 x N1 x K1)	7.68 x N1 x K1 (3 x N1 x K1)
Note 1: Applies for UE supporting power class 2&3&4. For UE supporting power class 1, N1 = 8 for all DRX cycle length.					
Note 2: M2 = 1.5 if SMTC periodicity of measured intra-frequency cell > 20 ms; otherwise M2=1.					
Note 3: K1 = 3 is the measurement relaxation factor applicable for UE fulfilling the *cellEdgeEvaluation* [2] criterion.					

[TS 38.133, Annex B.1.2]

This clause defines the following conditions for NR intra-frequency measurements performed based on SSBs for cell re-selection: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.1.2-1 for FR1 NR cells.

Table B.1.2-1: Conditions for intra-frequency cell re-selection in FR1

Parameter	NR operating band groups [Note1]	Minimum SSB_RP dBm / SCS$_{SSB}$		SSB Ês/Iot dB
		SCS$_{SSB}$ = 15 kHz	SCS$_{SSB}$ = 30 kHz	
Conditions	Depending on band group	-124+ Δ_{BG_offset}	-121+ Δ_{BG_offset}	≥ -4
NOTE 1: NR operating band groups are defined in TS 38.133 [6] clause 3.5.2.				
NOTE 2: For NR operating band groups, Δ_{BG_offset} is defined in clause 3A.4, Table 3A.4.1-2.				

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

[TS 38.133, clause 4.2.2.4]

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

When higher priority cells are found by the higher priority search, they shall be measured at least every $T_{measure,NR\_Inter}$. 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 clause shall still be met by the UE before it makes any determination that it may stop measuring the cell. If the UE detects on a NR carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE shall measure SS-RSRP or SS-RSRQ at least every $K_{carrier}$ * $T_{measure,NR\_Inter}$ 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 [1] within $K_{carrier} * T_{evaluate,NR\_Inter}$ when $T_{reselection} = 0$ provided that the reselection criteria is met by

- the condition when performing equal priority reselection and

- 6dB in FR1 or 7.5dB in FR2 for SS-RSRP reselections based on absolute priorities

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

[TS 38.133, clause 4.2.2.10.2]

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 *lowMobilityEvalutation* [2] criterion and UE has fulfilled, or

- UE is configured with both *lowMobilityEvalutation* [2] and *cellEdgeEvaluation* [2] criterion and *combineRelaxedMeasCondition* [2] not configured, and

- UE has fulfilled only the *lowMobilityEvalutation* [2] 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.

- $T_{measure,NR\_Inter}$ as specified in Table 4.2.2.10.2-1.

- $T_{evaluate,NR\_Inter}$ as specified in Table 4.2.2.10.2-1.

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

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

[TS 38.133, clause 4.2.2.10.3]

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* [2] criterion, and UE has fulfilled or

- UE is configured with both *lowMobilityEvalutation* [2] criterion and *cellEdgeEvaluation* [2] criterion and *combineRelaxedMeasCondition* [2] not configured, and

- UE has fulfilled only the *cellEdgeEvaluation* [2] 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 4.2.2.10.3-1.

- T$_{measure,NR\_Inter}$ as specified in Table 4.2.2.10.3-1.

- T$_{evaluate,NR\_Inter}$ as specified in Table 4.2.2.10.3-1.

Table 4.2.2.10.3-1: T$_{detect,NR\_Inter}$, T$_{measure,NR\_Inter}$ and T$_{evaluate,NR\_Inter}$

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

[TS 38.133, Annex B.1.3]

This clause defines the following conditions for NR inter-frequency measurements performed based on SSBs for cell re-selection: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions defined in Table B.1.2-1 for FR1 NR intra-frequency cell re-selection shall also apply for FR1 NR inter-frequency cells in this clause.

[TS 38.133, Annex B.1.2]

This clause defines the following conditions for NR intra-frequency measurements performed based on SSBs for cell re-selection: SSB_RP and SSB Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.1.2-1 for FR1 NR cells.

Table B.1.2-1: Conditions for intra-frequency cell re-selection in FR1

Parameter	NR operating band groups ^{Note1}	Minimum SSB_RP		SSB Ês/Iot
		dBm / SCS$_{SSB}$		dB
		SCS$_{SSB}$ = 15 kHz	SCS$_{SSB}$ = 30 kHz	
Conditions	Depending on band group	-124+ Δ$_{BG\_offset}$	-121+ Δ$_{BG\_offset}$	≥ -4
NOTE 1: NR operating band groups are defined in TS 38.133 [6] clause 3.5.2.				
NOTE 2: For NR operating band groups, Δ$_{BG\_offset}$ is defined in clause 3A.4, Table 3A.4.1-2.				

6.1.1.1 NR SA FR1 cell re-selection

6.1.1.1.1 Test purpose

The purpose of this test is to verify that when the current and target cell operates on the same carrier frequency the UE is able to search and measure cells to meet the intra-frequency NR cell re-selection requirements.

6.1.1.1.2 Test applicability

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

6.1.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.1.1.

6.1.1.1.4   Test description

6.1.1.1.4.1   Initial conditions

This test shall be run in one of the configurations defined in Table 6.1.1.1.4.1-1.

Table 6.1.1.1.4.1-1: Supported test configurations for NR SA FR1 cell re-selection

Configuration	Description
6.1.1.1-1	15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
6.1.1.1-2	15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
6.1.1.1-3	30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note:	The UE is only required to be tested in one of the supported test configurations.

Configure the test equipment and the DUT according to the parameters in Table 6.1.1.1.4.1-2.

Table 6.1.1.1.4.1-2: Initial conditions for NR SA FR1 cell re-selection

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.1.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part.		

1. The general test parameter settings are set up according to Table 6.1.1.1.4.1-3.

2. Message contents are defined in clause 6.1.1.1.4.3.

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

Table 6.1.1.1.4.1-3: General test parameters for NR SA FR1 cell re-selection

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3	Cell1	
T2 end condition	Active cell		1, 2, 3	Cell2	
	Neighbour cells		1, 2, 3	Cell1	
Final condition	Active cell		1, 2, 3	Cell1	
	Neighbour cell		1, 2, 3	Cell2	
RF Channel Number			1, 2, 3	1	
Time offset between cells			1	3 ms	Asynchronous cells
			2	3 μs	Synchronous cells
			3	3 μs	Synchronous cells
Access Barring Information		-	1, 2, 3	Not Sent	No additional delays in random access procedure.
SSB configuration			1	SSB.1 FR1	
			2	SSB.1 FR1	
			3	SSB.2 FR1	
SMTC configuration			1	SMTC.2	Configured in SIB2 of Cell 1
				SMTC.6	Configured in SIB2 of Cell 2
			2	SMTC.1	
			3	SMTC.1	
DRX cycle length		s	1, 2, 3	1.28	The value shall be used for all cells in the test.
PRACH configuration index			1, 2, 3	102	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
rangeToBestCell			1, 2, 3	Not configured	
T1		s	1, 2, 3	>7	During T1, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed, The intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T2
T2		s	1, 2, 3	40	T2 needs to be defined so that cell re-selection reaction time is taken into account.
T3		s	1, 2, 3	15	T3 needs to be defined so that cell re-selection reaction time is taken into account.

6.1.1.1.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) and an NR neighbour cell (Cell 2) on the same frequency. 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 *RRCSetupRequest* message to perform a Registration procedure for mobility.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* with 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 6.1.1.1.5-1. T1 starts.

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

4. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.1.1.1.5-1. T2 starts.

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 34 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 6.1.1.1.5-1. T3 starts.

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 8 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, continue 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* according to TS 38.508-1 [14] clause 4.5 in Cell 1.

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

6.1.1.1.4.3 Message contents

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

Table 6.1.1.1.4.3-1: Common Exception messages

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

Table 6.1.1.1.4.3-2: 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	-65	-130 is actual value in dBm (-65 * 2 dBm)	6.1.1.1-1, 6.1.1.1-2
	-64	-128 is actual value in dBm (-64 * 2 +1 dBm)	6.1.1.1-3
}			
}			

Table 6.1.1.1.4.3-3: SIB2 (Cell 1 and Cell 2)

Information Element	Value/remark	Comment	Condition
Derivation Path: Table H.2.1-1			
SIB2 ::= SEQUENCE {			
intraFreqCellReselectionInfo SEQUENCE {			
q-RxLevMin	-65	Actual value is -65*2 = -130dBm	6.1.1.1-1, 6.1.1.1-2
	-64	Actual value is -64*2 = -128dBm	6.1.1.1-3
smtc	SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2		6.1.1.1-1 AND Cell 1
	SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.6		6.1.1.1-1 AND Cell 2
	SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2		6.1.1.1-2, 6.1.1.1-3
deriveSSB-IndexFromCell	false		6.1.1.1-1
	true		6.1.1.1-2, 6.1.1.1-3
}			
}			

6.1.1.1.5   Test requirement

Tables 6.1.1.1.4.1-3 and 6.1.1.1.5-1 define the primary level settings including test tolerances for intra frequency NR cell re-selection test case.

Table 6.1.1.1.5-1: Cell specific test parameters for NR SA FR1 cell re-selection

Parameter	Unit	Test configuration	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
TDD configuration		1	N/A			N/A		
		2	TDDConf.1.1			TDDConf.1.1		
		3	TDDConf.2.1			TDDConf.2.1		
PDSCH RMC configuration		1	SR.1.1 FDD			SR.1.1 FDD		
		2	SR.1.1 TDD			SR.1.1 TDD		
		3	SR.2.1 TDD			SR.2.1 TDD		
RMSI CORESET RMC configuration		1	CR.1.1 FDD			CR.1.1 FDD		
		2	CR.1.1 TDD			CR.1.1 TDD		
		3	CR.2.1 TDD			CR.2.1 TDD		
Dedicated CORESET RMC configuration		1	CCR.1.1 FDD			CCR.1.1 FDD		
		2	CCR.1.1 TDD			CCR.1.1 TDD		
		3	CCR.2.1 TDD			CCR.2.1 TDD		
OCNG Pattern		1, 2, 3	OP.1 defined in A.2.1-1			OP.1 defined in A.2.1-1		
Initial DL BWP configuration		1, 2, 3	DLBWP.0.1			DLBWP.0.1		
Initial UL BWP configuration		1, 2, 3	ULBWP.0.1			ULBWP.0.1		
RLM-RS		1, 2, 3	SSB			SSB		
Qrxlevmin	dBm/SCS	1, 2	-130			-130		
		3	-127			-127		
Pcompensation	dB	1, 2, 3	0			0		
Qhyst$_s$	dB	1, 2, 3	0			0		
Qoffset$_{s, n}$	dB	1, 2, 3	0			0		
Cell_selection_and_ reselection_quality_m easurement		1, 2, 3	SS-RSRP			SS-RSRP		
$\hat{E}_s / I_{ot}$	dB	1	16	-3.55	3.24	-infinity	3.24	-3.55
		2						
		3						
N_{oc} Note2	dBm/SCS	1	-98					
		2	-98					
		3	-95					
N_{oc} Note2	dBm/15 kHz	1	-98					
		2						
		3						
$\hat{E}_s / N_{oc}$	dB	1	16	13	16.45	-infinity	16.45	13
		2						
		3						
SS-RSRP Note3	dBm/SCS	1	-82	-85	-81.55	-infinity	-81.55	-85
		2	-82	-85	-81.55	-infinity	-81.55	-85
		3	-79	-82	-78.54	-infinity	-78.54	-82
Io	dBm/9.36 MHz	1	-53.94	-51.91	-51.91	Specified in Cell 1 columns		
	dBm/9.36 MHz	2	-53.94	-51.91	-51.91			
	dBm/38.16 MHz	3	-47.85	-45.81	-45.81			
Treselection	s	1, 2, 3	0	0	0	0	0	0
SintrasearchP	dB	1, 2, 3	60			60		
Propagation Condition		1, 2, 3	AWGN					
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.								
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.								
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.								

The cell re-selection delay to a newly detectable cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update 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} = 32 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 33.28 seconds in this test case (note: this gives a total of 33.28 seconds but the test allows 34 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 *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update 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 = $T_{evaluate,NR\_Intra} + T_{SI-NR}$

$T_{evaluate,NR\_Intra}$ = 6.4 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 7.68 seconds in this test case (note: this gives a total of 7.68 seconds but the test allows 8 seconds).

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

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

6.1.1.2 NR SA FR1-FR1 cell re-selection

6.1.1.2.1 Test purpose

The purpose of this test is to verify the requirement for the inter frequency NR cell reselection.

6.1.1.2.2 Test applicability

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

6.1.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.1.2.

6.1.1.2.4 Test description

6.1.1.2.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 6.1.1.2.4.1-1.

Table 6.1.1.2.4.1-1: Supported test configurations for NR SA FR1-FR1 cell re-selection

Configuration	Description of serving cell	Description of target cell
6.1.1.2-1	15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
6.1.1.2-2	15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
6.1.1.2-3	30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note:	The UE is only required to be tested in one of the supported test configurations.	

Configure the test equipment and the DUT according to the parameters in Table 6.1.1.2.4.1-2.

Table 6.1.1.2.4.1-2: Initial conditions for NR SA FR1-FR1 cell re-selection

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.1.1.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. The general test parameter settings are set up according to Table 6.1.1.2.4.1-3.

2. Message contents are defined in clause 6.1.1.2.4.3.

3. There is two NR carrier and 2 NR Cells specified in the test. Cell 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 6.1.1.2.4.1-3: General test parameters for NR SA FR1-FR1 cell re-selection

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3	Cell2	The UE camps on cell 2 in the initial phase and during T1 period the UE reselects to cell 1
	Neighbour cell		1, 2, 3	Cell1	
T1 end condition	Active cell		1, 2, 3	Cell1	The UE shall perform reselection to cell 1 during T1
	Neighbour cells		1, 2, 3	Cell2	
T3 end condition	Active cell		1, 2, 3	Cell2	The UE shall perform reselection to cell 2 with higher priority during T3
	Neighbour cell		1, 2, 3	Cell1	
RF Channel Number			1, 2, 3	1, 2	
Time offset between cells			1	3 ms	Asynchronous cells
			2	3 μs	Synchronous cells
			3	3 μs	Synchronous cells
Access Barring Information		-	1, 2, 3	Not Sent	No additional delays in random access procedure.
SSB configuration			1	SSB.1 FR1	
			2	SSB.1 FR1	
			3	SSB.2 FR1	
SMTC configuration			1	SMTC 2	Configured in SIB4 of Cell 1
				SMTC.6	Configured in SIB4 of Cell 2
			2	SMTC 1	
			3	SMTC 1	
DRX cycle length		s	1, 2, 3	1.28	The value shall be used for all cells in the test.
PRACH configuration index			1, 2, 3	102	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
rangeToBestCell			1, 2, 3	Not configured	
T1		s	1, 2, 3	15	T1 needs to be defined so that cell re-selection reaction time is taken into account.
T2		s	1, 2, 3	>7	During T2, cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that cell 2 has not been detected by the UE prior to the start of period T3.
T3		s	1, 2, 3	75	T3 needs to be defined so that cell re-selection reaction time is taken into account.

6.1.1.2.4.2 Test procedure

The test consists of one active cell and one neighbour cell. The UE is requested to monitor the neighbouring cell on one of the NR carriers. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas and cell 2 is of higher priority than cell 1.

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

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* with 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 6.1.1.2.5-1. T1 starts.

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

4. If the UE responds on lower priority cell, Cell 1 during time duration T1 within 8 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 5a. 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 11.

5a. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.

6. The SS shall switch the power setting from T1 to T2 as specified in Table 6.1.1.2.5-1. T2 starts. 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.

7. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 6.1.1.2.5-1. T3 starts.

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

9. If the UE responds on higher priority cell, Cell 2 during time duration T3 within 68 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".

10. If the UE has re-selected Cell 2 within T3, after the re-selection or when T3 expires, continue with step 10a. Otherwise, if T3 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 11.

10a. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.

11. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 on Cell 2.

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

6.1.1.2.4.3 Message contents

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

Table 6.1.1.2.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	Table H.2.2-1 Table H.2.2-2 with Condition SSB.1 FR1, SMTC.2 and Asynchronous cells for configuration 6.1.1.2-1 and Cell 1 Table H.2.2-2 with Condition SSB.1 FR1, SMTC.6 and Asynchronous cells for configuration 6.1.1.2-1 and Cell 2 Table H.2.2-2 with Condition SSB.1 FR1, SMTC.1 and synchronous cells for configuration 6.1.1.2-2 Table H.2.2-2 with Condition SSB.2 FR1, SMTC.1 and synchronous cells for configuration 6.1.1.2-3 Table H.2.2-3
Default RRC messages and information elements contents exceptions	

6.1.1.2.5 Test requirement

Tables 6.1.1.2.4.1-3 and 6.1.1.2.5-1 define the primary level settings including test tolerances for inter frequency NR cell re-selection test case.

Table 6.1.1.2.5-1: Cell specific test parameters for NR SA FR1-FR1 cell re-selection

Parameter	Unit	Test configuration	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
TDD configuration		1	N/A			N/A		
		2	TDDConf.1.1			TDDConf.1.1		
		3	TDDConf.2.1			TDDConf.2.1		
PDSCH RMC configuration		1	SR.1.1 FDD			SR.1.1 FDD		
		2	SR.1.1 TDD			SR.1.1 TDD		
		3	SR.2.1 TDD			SR.2.1 TDD		
RMSI CORESET RMC configuration		1	CR.1.1 FDD			CR.1.1 FDD		
		2	CR.1.1 TDD			CR.1.1 TDD		
		3	CR.2.1 TDD			CR.2.1 TDD		
Dedicated CORESET RMC configuration		1	CCR.1.1 FDD			CCR.1.1 FDD		
		2	CCR.1.1 TDD			CCR.1.1 TDD		
		3	CCR.2.1 TDD			CCR.2.1 TDD		
OCNG Pattern		1, 2, 3	OP.1 defined in A.2.1-1			OP.1 defined in A.2.1-1		
Initial DL BWP configuration		1, 2, 3	DLBWP.0.1			DLBWP.0.1		
Initial UL BWP configuration		1, 2, 3	ULBWP.0.1			ULBWP.0.1		
RLM-RS		1, 2, 3	SSB			SSB		
Qrxlevmin	dBm/SCS	1, 2	-140			-140		
		3	-137			-137		
Pcompensation	dB	1, 2, 3	0			0		
Cell_selection_and_ reselection_quality_m easurement		1, 2, 3	SS-RSRP			SS-RSRP		
$\hat{E}_s/I_{ot}$	dB	1	15.6	15.6	15.6	-3.6	-infinity	13.6
		2						
		3						
N_{oc} Note2	dBm/SCS	1	-98			-100	-98	-98
		2	-98			-100	-98	-98
		3	-95			-97	-95	-95
N_{oc} Note2	dBm/15 kHz	1	-98			-100	-98	-98
		2						
		3						
$\hat{E}_s/N_{oc}$	dB	1	15.6	15.6	15.6	-3.6	-infinity	13.6
		2						
		3						

Parameter	Unit	Test configuration	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
SS-RSRP Note3	dBm/SCS	1	-82.4	-82.4	-82.4	-103.6	-infinity	-84.4
		2	-82.4	-82.4	-82.4	-103.6	-infinity	-84.4
		3	-79.39	-79.39	-79.39	-100.59	-infinity	-81.39
Io	dBm/9.36 MHz	1	-54.33	-54.33	-54.33	-70.46	-infinity	-56.26
	dBm/9.36 MHz	2	-54.33	-54.33	-54.33	-70.46	-infinity	-56.26
	dBm/38.16 MHz	3	-48.23	-48.23	-48.23	-67.37	-infinity	-53.17
Treselection	s	1, 2, 3	0	0	0	0	0	0
SnonintrasearchP	dB	1, 2, 3	50			50		
Thresh$_{x, highP}$	dB	1, 2, 3	48			48		
Thresh$_{serving, lowP}$	dB	1, 2, 3	44			44		
Thresh$_{x, lowP}$	dB	1, 2, 3	50			50		
Propagation Condition		1, 2, 3	AWGN					
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.								
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.								
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.								

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

The cell re-selection delay to a higher priority cell shall be less than 68 s.

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

The cell re-selection delay to a lower priority cell shall be less than 8 s.

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

> NOTE: The cell re-selection delay to a higher priority cell can be expressed as: $T_{higher\_priority\_search} + T_{evaluate, NR\_ inter} + T_{SI-NR}$, and to a lower priority cell can be expressed as: $T_{evaluate, NR\_ inter} + T_{SI-NR}$,

Where:

$T_{higher\_priority\_search}$ See clause 4.2.2.7 of TS 38.133 [6]

$T_{evaluate, NR\_ inter}$ See Table 4.2.2.4-1 in clause 4.2.2.4 of TS 38.133 [6]

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

This gives a total of 67.68 s, allow 68 s for the cell re-selection delay to a higher priority cell and 7.68 s for the cell re-selection delay to a lower priority cell in the test case, which we allow 8 s.

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

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

6.1.1.3   NR SA FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

6.1.1.3.1   Test purpose

The purpose of this test is to verify the requirement for the intra frequency NR cell reselection requirements for UE fulfilling low mobility criterion specified in TS 38.133 [6] clause 4.2.2.9.2.

6.1.1.3.2   Test applicability

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

6.1.1.3.3   Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.1.3.

6.1.1.3.4   Test description

6.1.1.3.4.1   Initial conditions

This test shall be run in one of the configurations defined in Table 6.1.1.3.4.1-1.

Table 6.1.1.3.4.1-1: Supported test configurations for NR SA FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

Configuration	Description
6.1.1.3-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.1.1.3-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6.1.1.3-3	30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note:	The UE is only required to be tested in one of the supported test configurations.

Configure the test equipment and the DUT according to the parameters in Table 6.1.1.3.4.1-2.

Table 6.1.1.3.4.1-2: Initial conditions for NR SA FR1 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 6.1.1.3.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part.		

1. The general test parameter settings are set up according to Table 6.1.1.3.4.1-3.

2. Message contents are defined in clause 6.1.1.3.4.3.

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 6.1.1.3.4.1-3: General test parameters for NR SA FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3	Cell1	The UE camps on cell 1 in the initial phase
	Neighbour cells		1, 2, 3	Cell2	
T1 end condition	Active cell		1, 2, 3	Cell2	The UE reselects to cell 2 during T1 period
	Neighbour cells		1, 2, 3	Cell1	
Final condition	Active cell		1, 2, 3	Cell1	The UE reselects to cell 1 during T2 period
	Neighbour cells		1, 2, 3	Cell2	
RF Channel Number			1, 2, 3	1	
Time offset between cells			1	3 ms	Asynchronous cells
			2	3 μs	Synchronous cells
			3	3 μs	Synchronous cells
Access Barring Information		-	1, 2, 3	Not Sent	No additional delays in random access procedure.
SSB configuration			1	SSB.1 FR1	
			2	SSB.1 FR1	
			3	SSB.2 FR1	
SMTC configuration			1	SMTC pattern 2	Configured in SIB2 of Cell 1
				SMTC pattern 6	Configured in SIB2 of Cell 2
			2	SMTC pattern 1	
			3	SMTC pattern 1	
DRX cycle length		s	1, 2, 3	0.64	The value shall be used for all cells in the test.
PRACH configuration index			1, 2, 3	102	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
rangeToBestCell			1, 2, 3	Not configured	
T1		s	1, 2, 3	25	T1 needs to be defined so that cell re-selection reaction time is taken into account.
T2		s	1, 2, 3	25	T2 needs to be defined so that cell re-selection reaction time is taken into account.

6.1.1.3.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) and an NR neighbour cell (Cell 2) on the same frequency. The test consists of 2 successive time periods, with time duration of T1, and 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. 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 *RRCSetupRequest* message to perform a Registration procedure for mobility.

Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1. *lowMobilityEvaluation-r16* is provided in SIB2 of Cell 1 and Cell 2. Set Cell 2 physical cell identity = initial cell 2 physical cell identity.

SIB2 of Cell 1 and Cell 2 are configured as follows:

- *lowMobilityEvaluation-r16* is configured according to the parameters listed in Table 6.1.1.3.5-1.

- *cellEdgeEvaluation-r16* and *combineRelaxedMeasCondition* are not configured.

1. Set the parameters according to T2 in Table 6.1.1.3.5-1. Then wait 54s to ensure that Cell 2 has been detected by the UE.

2. Set the parameters according to T1 in Table 6.1.1.3.5-1. 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 within 17 seconds from the beginning of time period T1, then count a success for the event "Re-select Cell 2". Otherwise count a fail for the event "Re-select Cell 2".

5. If the UE has re-selected Cell 2 within T1, after the re-selection or when T1 expires, continue with step 7. 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 13.

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

7. The SS shall switch the power setting from T1 to T2 as specified in Table 6.1.1.3.5-1. T2 starts.

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

9. If the UE responds on Cell 1 within 17 seconds from the beginning of time period T2, then count a success for the event "Re-select Cell 1". Otherwise count a fail for the event "Re-select Cell 1".

10. If the UE has re-selected Cell 1 within T2, after the re-selection or when T2 expires, continue with step 12. Otherwise, if T2 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 13.

11. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1. skip to 15

12. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 in Cell 1.

13. Set the parameters according to T2 in Table 6.1.1.3.5-1. Then wait 54s to ensure that Cell 2 has been detected by the UE.

14. Repeat step 2-14 until a test verdict has been achieved. Each of the events "Re-select Cell 2" and "Re-select Cell 1" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict. If both events pass, the test passes. If one event fails, the test fails.

6.1.1.3.4.3   Message contents

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

Table 6.1.1.3.4.3-1: 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 6.1.1.3.4.3-2: SIB1 (Cell 1 and Cell 2)

Information Element	Value/remark	Comment	Condition
Derivation Path: Table H.2.1-3			
SIB1 ::= SEQUENCE {			
servingCellConfigCommon SEQUENCE {			
downlinkConfigCommon SEQUENCE {			
pcch-Config SEQUENCE {			
defaultPagingCycle	rf64		
}			
}			
}			
}			

Table 6.1.1.3.4.3-3: SIB2 (Cell 1)

Information Element	Value/remark	Comment	Condition
Derivation Path: Table H.2.1-1			
SIB2 ::= SEQUENCE {			
intraFreqCellReselectionInfo SEQUENCE {			
smtc	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2		6.1.1.3-1
	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1		6.1.1.3-2, 6.1.1.3-3
deriveSSB-IndexFromCell	false		6.1.1.3-1
	true		6.1.1.3-2, 6.1.1.3-3
}			
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		
}			
}			

Table 6.1.1.3.4.3-4: SIB2 (Cell 2)

Information Element	Value/remark	Comment	Condition
Derivation Path: Table H.2.1-1			
SIB2 ::= SEQUENCE {			
intraFreqCellReselectionInfo SEQUENCE {			
smtc	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.6		6.1.1.3-1
	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1		6.1.1.3-2, 6.1.1.3-3
deriveSSB-IndexFromCell	false		6.1.1.3-1
	true		6.1.1.3-2, 6.1.1.3-3
}			
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		
}			

}			

6.1.1.3.5 Test requirement

Tables 6.1.1.3.4.1-3 and 6.1.1.3.5-1 define the primary level settings including test tolerances for NR SA FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion test case.

Table 6.1.1.3.5-1: Cell specific test parameters for NR SA FR1 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	N/A		N/A	
		2	TDDConf.1.1		TDDConf.1.1	
		3	TDDConf.2.1		TDDConf.2.1	
PDSCH RMC configuration		1	SR.1.1 FDD		N/A	
		2	SR.1.1 TDD			
		3	SR.2.1 TDD			
RMSI CORESET RMC configuration		1	CR.1.1 FDD		CR.1.1 FDD	
		2	CR.1.1 TDD		CR.1.1 TDD	
		3	CR.2.1 TDD		CR.2.1 TDD	
Dedicated CORESET RMC configuration		1	CCR.1.1 FDD		CCR.1.1 FDD	
		2	CCR.1.1 TDD		CCR.1.1 TDD	
		3	CCR.2.1 TDD		CCR.2.1 TDD	
OCNG Pattern		1, 2, 3	OP.1 defined in A.3.2.1		OP.1 defined in A.3.2.1	
Initial DL BWP configuration		1, 2, 3	DLBWP.0.1		DLBWP.0.1	
Initial UL BWP configuration		1, 2, 3	ULBWP.0.1		ULBWP.0.1	
RLM-RS		1, 2, 3	SSB		SSB	
Qrxlevmin	dBm/SCS	1, 2	-140		-140	
		3	-137		-137	
Pcompensation	dB	1, 2, 3	0		0	
Qhyst$_s$	dB	1, 2, 3	0		0	
Qoffset$_{s, n}$	dB	1, 2, 3	0		0	
S$_{SearchDeltaP}$	dB	1, 2, 3	6		6	
T$_{SearchDeltaP}$	s	1, 2, 3	5		5	
Cell_selection_and_ reselection_quality_ measurement		1, 2, 3	SS-RSRP		SS-RSRP	
$\hat{E}_s/I_{ot}$	dB	1, 2, 3	-3.56	3.22	3.22	-3.56
N_{oc} Note2	dBm/SCS	1	-98			
		2	-98			
		3	-95			
N_{oc} Note2	dBm/15 kHz	1, 2, 3	-98			
$\hat{E}_s / N_{oc}$	dB	1, 2, 3	12.55	16	16	12.55
SS-RSRP Note3	dBm/SCS	1	-85.45	-82	-82	-85.45
		2	-85.45	-82	-82	-85.45
		3	-82.45	-79	-79	-82.45
Io	dBm/9.36 MHz	1	-52.35	-52.35	specified in Cell 1 columns-	
	dBm/9.36 MHz	2	-52.35	-52.35		
	dBm/38.16 MHz	3	-46.25	-46.25		
Treselection	s	1, 2, 3	0	0	0	0
SintrasearchP	dB	1, 2, 3	60		60	
Propagation Condition		1, 2, 3	AWGN			
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.						
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.						
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.						

The cell re-selection delay to detected cell 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 2, and starts to send preambles on the PRACH

for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on Cell 2.

The cell re-selection delay to detected cell for UE fulfilling low mobility 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 Registration procedure for mobility and periodic registration update on Cell 1.

The cell re-selection delay to a detected cell test requirement for UE fulfilling low mobility criterion in this case is expressed as:

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

$T_{evaluate,NR\_Intra} = 15.36$ s; as specified in TS 38.133 [6] Table 4.2.2.9.2-1.

$T_{SI\text{-}NR} = 1.28$ s; 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 16.64 s, allow 17 s for the cell re-selection delay to an already detected 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%.

6.1.1.4 NR SA FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

6.1.1.4.1 Test purpose

The purpose of this test is to verify the requirement for the intra frequency NR cell reselection requirements for UE fulfilling not-at-cell edge criterion specified in TS 38.133 [6] clause 4.2.2.9.3.

6.1.1.4.2 Test applicability

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

6.1.1.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.1.4.

6.1.1.4.4 Test description

6.1.1.4.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 6.1.1.4.4.1-1.

Table 6.1.1.4.4.1-1: Supported test configurations for NR SA FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

Configuration	Description
6.1.1.4-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.1.1.4-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6.1.1.4-3	30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note:	The UE is only required to be tested in one of the supported test configurations.

Configure the test equipment and the DUT according to the parameters in Table 6.1.1.4.4.1-2.

Table 6.1.1.4.4.1-2: Initial conditions for NR SA FR1 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 6.1.1.4.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part.		

1. The general test parameter settings are set up according to Table 6.1.1.4.4.1-3.

2. Message contents are defined in clause 6.1.1.4.4.3.

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 6.1.1.4.4.1-3: General test parameters for NR SA FR1 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, 3	Cell1	The UE camps on Cell 1 in the initial phase
	Neighbour Cells		1, 2, 3	Cell2	
T1 end condition	Active Cell		1, 2, 3	Cell2	The UE shall fulfil the not-at-cell edge criterion and reselect to cell 2 during T1 period during T1.
	Neighbour Cells		1, 2, 3	Cell1	
T2 end condition	Active Cell		1, 2, 3	Cell1	The UE shall perform reselection to Cell 1 during T2
	Neighbour Cells		1, 2, 3	Cell2	
RF Channel Number			1, 2, 3	1	
Time offset between Cells			1	3 ms	Asynchronous Cells
			2	3 µs	Synchronous Cells
			3	3 µs	Synchronous Cells
Access Barring Information		-	1, 2, 3	Not Sent	No additional delays in random access procedure.
SSB configuration			1	SSB.1 FR1	
			2	SSB.1 FR1	
			3	SSB.2 FR1	
SMTC configuration			1	SMTC pattern 2	Configured in SIB2 of Cell 1
				SMTC pattern 6	Configured in SIB2 of Cell 2
			2	SMTC pattern 1	
			3	SMTC pattern 1	
DRX cycle length		s	1, 2, 3	0.64	The value shall be used for all Cells in the test.
PRACH configuration index			1, 2, 3	102	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
rangeToBestCell			1, 2, 3	Not configured	
T1		s	1, 2, 3	20	T1 needs to be defined so that Cell re-selection reaction time is taken into account.
T2		s	1, 2, 3	20	T2 needs to be defined so that Cell re-selection reaction time is taken into account.

6.1.1.4.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) and an NR neighbour cell (Cell 2) on the same frequency. The test consists of 2 successive time periods, with time duration of T1, and 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. 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 *RRCSetupRequest* message to perform a Registration procedure for mobility.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 1. *cellEdgeEvaluation-r16* is provided in SIB2 of Cell 1 and Cell 2. Set Cell 2 physical cell identity = initial cell 2 physical cell identity.

2. Set the parameters according to T2 in Table 6.1.1.4.5-1. Then wait 54s to ensure that Cell 2 has been detected by the UE.

3. Set the parameters according to T1 in Table 6.1.1.4.5-1. T1 starts.

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

5. If the UE responds on Cell 2 within 34 seconds from the beginning of time period T1, then count a success for the event "Re-select Cell 2". Otherwise count a fail for the event "Re-select Cell 2".

6. If the UE has re-selected Cell 2 within T1, after the re-selection or when T1 expires, continue with step 7. 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 13.

7. 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 T1 to T2 as specified in Table 6.1.1.4.5-1. T2 starts.

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

10. If the UE responds on Cell 1 within 17 seconds from the beginning of time period T2, then count a success for the event "Re-select Cell 1". Otherwise count a fail for the event "Re-select Cell 1".

11. If the UE has re-selected Cell 1 within T2, after the re-selection or when T2 expires, continue with step 12. Otherwise, if T2 expires and the UE has not yet re-selected Cell 1, the TE shall switch off and on the UE and skip to step 13.

12. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1. skip to 15

13. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 in Cell 1.

14. Set the parameters according to T2 in Table 6.1.1.4.5-1. Then wait 54s to ensure that Cell 2 has been detected by the UE.

15. Repeat step 2-14 until a test verdict has been achieved. Each of the events "Re-select Cell 2" and "Re-select Cell 1" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. Different events may require different times for a verdict. If both events pass, the test passes. If one event fails, the test fails.

6.1.1.4.4.3 Message contents

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

Table 6.1.1.4.4.3-1: 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 6.1.1.4.4.3-2: SIB1 (Cell 1 and Cell 2)

Derivation Path: TS 38.508-1 [14], Table 4.6.1-28			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB1 ::= SEQUENCE {			
servingCellConfigCommon SEQUENCE {			
downlinkConfigCommon SEQUENCE {			
pcch-Config SEQUENCE {			
defaultPagingCycle	rf64		
}			
}			
}			
}			

Table 6.1.1.4.4.3-3: SIB2 (Cell 1)

Derivation Path: Table H.2.1-1			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB2 ::= SEQUENCE {			
intraFreqCellReselectionInfo SEQUENCE {			
smtc	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2		6.1.1.4-1
	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1		6.1.1.4-2, 6.1.1.4-3
deriveSSB-IndexFromCell	false		6.1.1.4-1
	true		6.1.1.4-2, 6.1.1.4-3
}			
relaxedMeasurement-r16 SEQUENCE {			
cellEdgeEvaluation-r16 SEQUENCE {			
s-SearchThresholdP-r16	25	Actual value is 35*2 = 50dB	T1
	Not present		T2
s-SearchThresholdQ-r16	Not present		
}			
cellEdgeEvaluation-r16	Not present		
combineRelaxedMeasCondition-r16	Not present		
highPriorityMeasRelax-r16	Not present		
}			
}			

Table 6.1.1.4.4.3-4: SIB2 (Cell 2)

Derivation Path: Table H.2.1-1			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB2 ::= SEQUENCE {			
intraFreqCellReselectionInfo SEQUENCE {			

smtc	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.6		6.1.1.4-1
	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1		6.1.1.4-2, 6.1.1.4-3
deriveSSB-IndexFromCell	false		6.1.1.4-1
	true		6.1.1.4-2, 6.1.1.4-3
}			
relaxedMeasurement-r16 SEQUENCE {			
cellEdgeEvaluation-r16 SEQUENCE {			
s-SearchThresholdP-r16	25	Actual value is 35*2 = 50dB	T2
	Not present		T1
s-SearchThresholdQ-r16	Not present		
}			
cellEdgeEvaluation-r16	Not present		
combineRelaxedMeasCondition-r16	Not present		
highPriorityMeasRelax-r16	Not present		
}			
}			

6.1.1.4.5   Test requirement

Tables 6.1.1.4.4.1-3 and 6.1.1.4.5-1 define the primary level settings including test tolerances for NR SA FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion test case.

Table 6.1.1.4.5-1: Cell specific test parameters for NR SA FR1 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	N/A		N/A	
		2	TDDConf.1.1		TDDConf.1.1	
		3	TDDConf.2.1		TDDConf.2.1	
PDSCH RMC configuration		1	SR.1.1 FDD		N/A	
		2	SR.1.1 TDD			
		3	SR.2.1 TDD			
RMSI CORESET RMC configuration		1	CR.1.1 FDD		CR.1.1 FDD	
		2	CR.1.1 TDD		CR.1.1 TDD	
		3	CR.2.1 TDD		CR.2.1 TDD	
Dedicated CORESET RMC configuration		1	CCR.1.1 FDD		CCR.1.1 FDD	
		2	CCR.1.1 TDD		CCR.1.1 TDD	
		3	CCR.2.1 TDD		CCR.2.1 TDD	
OCNG Pattern		1, 2, 3	OP.1 defined in A.3.2.1		OP.1 defined in A.3.2.1	
Initial DL BWP configuration		1, 2, 3	DLBWP.0.1		DLBWP.0.1	
Initial UL BWP configuration		1, 2, 3	ULBWP.0.1		ULBWP.0.1	
RLM-RS		1, 2, 3	SSB		SSB	
Qrxlevmin	dBm/SCS	1, 2	-140		-140	
		3	-137		-137	
Pcompensation	dB	1, 2, 3	0		0	
$Qhyst_s$	dB	1, 2, 3	0		0	
$Qoffset_{s, n}$	dB	1, 2, 3	0		0	

Parameter	Unit	Test configuration	Cell 1		Cell 2	
			T1	**T2**	**T1**	**T2**
Cell_selection_and_ reselection_quality_ measurement		1, 2, 3	SS-RSRP		SS-RSRP	
$\hat{E}_s/I_{ot}$	dB	1	-3.56	3.22	3.22	-3.56
		2				
		3				
N_{oc} Note2	dBm/SCS	1	-98			
		2	-98			
		3	-95			
N_{oc} Note2	dBm/15 kHz	1	-98			
		2				
		3				
$\hat{E}_s/N_{oc}$	dB	1	12.55	16	16	12.55
		2				
		3				
SS-RSRP Note3	dBm/SCS	1	-85.45	-82	-82	-85.45
		2	-85.45	-82	-82	-85.45
		3	-82.45	-79	-79	-82.45
Io	dBm/9.36 MHz	1	-52.35	-52.35	-52.35	-52.35
	dBm/9.36 MHz	2	-52.35	-52.35	-52.35	-52.35
	dBm/38.16 MHz	3	-46.25	-46.25	-46.25	-46.25
Treselection	s	1, 2, 3	0	0	0	0
SintrasearchP	dB	1, 2, 3	60		60	
S$_{searchThresholdP}$	dB	1, 2, 3	50	Not sent	Not sent	50
Propagation Condition		1, 2, 3	AWGN			
Note 1: OCNG shall be used such that both Cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.						
Note 2: Interference from other Cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.						
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.						

The cell re-selection delay to detected cell 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 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on Cell 2.

The cell re-selection delay to detected cell for UE fulfilling not-at-cell edge 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 Registration procedure for mobility and periodic registration update on Cell 1.

The cell re-selection delay to a detected cell test requirement for UE fulfilling not-at-cell edge criterion in this case is expressed as:

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

$T_{evaluate,NR\_Intra}$ = 15.36 s; as specified in TS 38.133 [6] Table 4.2.2.9.3-1.

T_{SI-NR} = 1.28 s; 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 16.64 s, allow 17 s for the cell re-selection delay to an already detected 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%.

6.1.1.5 NR SA FR1-FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

6.1.1.5.1 Test purpose

The purpose of this test is to verify the requirement for the inter-frequency NR cell reselection requirements for UE fulfilling low mobility criterion specified in TS 38.133 [6] clause 4.2.2.10.2.

6.1.1.5.2 Test applicability

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

6.1.1.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.1.5.

6.1.1.5.4 Test description

6.1.1.5.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 6.1.1.5.4.1-1.

Table 6.1.1.5.4.1-1: Supported test configurations for NR SA FR1-FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

Configuration	Description of serving cell	Description of target cell
6.1.1.5-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.1.1.5-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6.1.1.5-3	30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode	30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.		

Configure the test equipment and the DUT according to the parameters in Table 6.1.1.5.4.1-2.

Table 6.1.1.5.4.1-2: Initial conditions for NR SA FR1-FR1 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 6.1.1.5.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part.		

1. The general test parameter settings are set up according to Table 6.1.1.5.4.1-3.

2. Message contents are defined in clause 6.1.1.5.4.3.

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

Table 6.1.1.5.4.1-3: General test parameters for NR SA FR1-FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3	Cell2	The UE camps on cell 2 in the initial phase, it fulfils Low Mobility relaxation measurements criterion, and during T1 period the UE reselects to cell 1
	Neighbour cells		1, 2, 3	Cell1	
T1 end condition	Active cell		1, 2, 3	Cell1	The UE shall perform reselection to cell 1 during T1
	Neighbour cells		1, 2, 3	Cell2	
T2 end condition	Active cell		1, 2, 3	Cell2	The UE shall perform reselection to cell 2 with higher priority during T2
	Neighbour cells		1, 2, 3	Cell1	
RF Channel Number			1, 2, 3	1, 2	
Time offset between cells			1	3 ms	Asynchronous cells
			2	3 µs	Synchronous cells
			3	3 µs	Synchronous cells
Access Barring Information		-	1, 2, 3	Not Sent	No additional delays in random access procedure.
SSB Configuration			1	SSB.1 FR1	
			2	SSB.1 FR1	
			3	SSB.2 FR1	
SMTC configuration			1	SMTC pattern 2	Configured in SIB4 of Cell 1
				SMTC pattern 6	Configured in SIB4 of Cell 2
			2	SMTC pattern 1	
			3	SMTC pattern 1	
DRX cycle length		s	1, 2, 3	0.64	The value shall be used for all cells in the test.
PRACH configuration index			1, 2, 3	102	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
rangeToBestCell			1, 2, 3	Not configured	
T1		s	1, 2, 3	25 s	T1 is defined so that cell re-selection reaction time is taken into account.
T2		s	1, 2, 3	25 s	T2 is defined so that cell re-selection reaction time is taken into account.

6.1.1.5.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR Cell 1 and Cell 2 on different frequencies. The test consists of 2 successive time periods, with time duration of T1, and 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. 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 *RRCSetupRequest* message to perform a Registration procedure for mobility.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 2. SIB2 of Cell 1 and Cell 2 are configured as follows:

   lowMobilityEvaluation-r16 is configured according to the parameters listed in Table 6.1.1.5.5-1.

   cellEdgeEvaluation-r16 and *combineRelaxedMeasCondition* are not configured.

2. Set the parameters according to T1 in Table 6.1.1.5.5-1. 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 Cell 1 within 17 seconds from the beginning of time period T1, then count a success for the event "Re-select Cell 1". Otherwise count a fail for the event "Re-select 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 T2 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.

6. 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 6.1.1.5.5-1. T2 starts.

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

9. If the UE responds on Cell 2 within 17 seconds from the beginning of time period T2, then count a success for the event "Re-select Cell 2". Otherwise count a fail for the event "Re-select Cell 2".

10. If the UE has re-selected Cell 2 within T2, after the re-selection or when T2 expires, continue with step 11. 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.

11. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2. skip to 13

12. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 in Cell 2.

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

6.1.1.5.4.3   Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:Table 6.1.1.5.4.3-1: SIB1 (Cell 1 and Cell 2)

Derivation Path: TS 38.508-1 [14], Table 4.6.1-28			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB1 ::= SEQUENCE {			
servingCellConfigCommon SEQUENCE {			
downlinkConfigCommon SEQUENCE {			
pcch-Config SEQUENCE {			
defaultPagingCycle	rf64		
}			
}			
}			
}			

Table 6.1.1.5.4.3-2: SIB2 (Cell 1)

Derivation Path: Table H.2.2-1			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB2 ::= SEQUENCE {			
cellReselectionServingFreqInfo SEQUENCE {			
s-NonIntraSearchP	Not present		
threshServingLowP	22	Actual value = 22*2 = 44dB	
}			
relaxedMeasurement-r16 SEQUENCE {			
lowMobilityEvaluation-r16 SEQUENCE {			
s-SearchDeltaP-r16	dB3		
t-SearchDeltaP-r16	s5		
}			
cellEdgeEvaluation-r16	Not present		
combineRelaxedMeasCondition-r16	Not present		
highPriorityMeasRelax-r16	Not present		
}			
}			

Table 6.1.1.5.4.3-3: SIB2 (Cell 2)

Information Element	Value/remark	Comment	Condition
Derivation Path: Table H.2.2-1			
SIB2 ::= SEQUENCE {			
cellReselectionServingFreqInfo SEQUENCE {			
s-NonIntraSearchP	Not present		
threshServingLowP	23	Actual value = 23*2 = 46dB	Cell 2
}			
relaxedMeasurement-r16 SEQUENCE {			
lowMobilityEvaluation-r16 SEQUENCE {			
s-SearchDeltaP-r16	dB15		Cell 2
t-SearchDeltaP-r16	s5		
}			
cellEdgeEvaluation-r16	Not present		
combineRelaxedMeasCondition-r16	Not present		
highPriorityMeasRelax-r16	Not present		
}			
}			

Table 6.1.1.5.4.3-4: SIB4 (Cell 1)

Information Element	Value/remark	Comment	Condition
Derivation Path: Table H.2.2-2			
SIB4 ::= SEQUENCE {			
interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo {	1 entry		
InterFreqCarrierFreqInfo[1] SEQUENCE {		entry 1	
dl-CarrierFreq	ARFCN-ValueNR for Cell 2		
smtc	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2		6.1.1.5-1
	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1		6.1.1.5-2, 6.1.1.5-3
deriveSSB-IndexFromCell	false		6.1.1.5-1
	true		6.1.1.5-2, 6.1.1.5-3
threshX-HighP	24	Actual value = 24*2 = 48dB	
threshX-LowP	24	Actual value = 24*2 = 48dB	
cellReselectionPriority	5	Same as the priority in SIB 2 of Cell 2.	
}			
}			
}			

Table 6.1.1.5.4.3-5: SIB4 (Cell 2)

Information Element	Value/remark	Comment	Condition
Derivation Path: Table H.2.2-2			
SIB4 ::= SEQUENCE {			
interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo {	1 entry		
InterFreqCarrierFreqInfo[1] SEQUENCE {		entry 1	
dl-CarrierFreq	ARFCN-ValueNR for Cell 1 SSB		Cell 2
smtc	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.6		6.1.1.5-1
	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1		6.1.1.5-2, 6.1.1.5-3
deriveSSB-IndexFromCell	false		6.1.1.5-1
	true		6.1.1.5-2, 6.1.1.5-3
threshX-HighP	22	Actual value = 22*2 = 44dB	Cell 2
threshX-LowP	25	Actual value = 25*2 = 50dB	Cell 2
cellReselectionPriority	4	Same as the priority in SIB 2 of Cell 1.	Cell 2
}			
}			
}			

6.1.1.5.5 Test requirement

Tables 6.1.1.5.4.1-3 and 6.1.1.5.5-1 define the primary level settings including test tolerances for NR SA FR1-FR1 cell re-selection for UE fulfilling low mobility relaxed measurement criterion test case.

Table 6.1.1.5.5-1: Cell specific test parameters for NR SA FR1-FR1 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	N/A		N/A	
		2	TDDConf.1.1		TDDConf.1.1	
		3	TDDConf.2.1		TDDConf.2.1	
PDSCH RMC configuration		1	SR.1.1 FDD		SR.1.1 FDD	
		2	SR.1.1 TDD		SR.1.1 TDD	
		3	SR.2.1 TDD		SR.2.1 TDD	
RMSI CORESET RMC configuration		1	CR.1.1 FDD		CR.1.1 FDD	
		2	CR.1.1 TDD		CR.1.1 TDD	
		3	CR.2.1 TDD		CR.2.1 TDD	
Dedicated CORESET RMC configuration		1	CCR.1.1 FDD		CCR.1.1 FDD	
		2	CCR.1.1 TDD		CCR.1.1 TDD	
		3	CCR.2.1 TDD		CCR.2.1 TDD	
OCNG Pattern		1, 2, 3	OP.1 defined in A.3.2.1		OP.1 defined in A.3.2.1	
Initial DL BWP configuration		1, 2, 3	DLBWP.0.1		DLBWP.0.1	
Initial UL BWP configuration		1, 2, 3	ULBWP.0.1		ULBWP.0.1	
RLM-RS		1, 2, 3	SSB		SSB	
Qrxlevmin	dBm/SCS	1, 2	-140		-140	
		3	-137		-137	
Pcompensation	dB	1, 2, 3	0		0	

Parameter	Unit	Test configuration	Cell 1		Cell 2	
			T1	T2	T1	T2
Qhyst$_s$	dB	1, 2, 3	0		0	
Qoffset$_{s, n}$	dB	1, 2, 3	0		0	
Cell_selection_and_ reselection_quality_measurement		1, 2, 3	SS-RSRP		SS-RSRP	
$\hat{E}_s/I_{ot}$	dB	1	14	14	-3.70	9.75
		2				
		3				
N_{oc} Note2	dBm/SCS	1	-98			
		2	-98			
		3	-95			
N_{oc} Note2	dBm/15 kHz	1	-98			
		2				
		3				
$\hat{E}_s / N_{oc}$	dB	1	14	14	-3.70	9.75
		2				
		3				
SS-RSRP Note3	dBm/SCS	1	-84	-84	-101.70	-88.25
		2	-84	-84	-101.70	-88.25
		3	-81	-81	-98.70	-85.25
Io	dBm/9.36 MHz	1	-55.88	-55.88	-68.50	-59.86
	dBm/9.36 MHz	2	-55.88	-55.88	-68.50	-59.86
	dBm/38.16 MHz	3	-49.79	-49.79	-62.40	-53.76
Treselection	s	1, 2, 3	0	0	0	0
SnonintrasearchP	dB	1, 2, 3	Not sent		Not sent	
Thresh$_{x, highP}$	dB	1, 2, 3	48		44	
Thresh$_{serving, lowP}$	dB	1, 2, 3	44		46	
Thresh$_{x, lowP}$	dB	1, 2, 3	48		50	
S$_{SearchDeltaP}$	dB	1, 2, 3	3		15	
T$_{SearchDeltaP}$	s	1, 2, 3	5		5	
Propagation Condition		1, 2, 3	AWGN			
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.						
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.						
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.						

The cell re-selection delay to detected lower priority cell 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 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on Cell 2.

The cell re-selection delay to a detected cell test requirement for UE fulfilling low mobility criterion in this case is expressed as:

Cell re-selection delay to a detected lower priority cell = T$_{evaluate,NR\_Inter}$ + T$_{SI-NR}$

T$_{evaluate,NR\_Inter}$ = 15.36 s; as specified in TS 38.133 [6] Table 4.2.2.10.2-1.

T_{SI-NR} = 1.28 s; 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 16.64 s, allow 17 s for the cell re-selection delay to an already detected lower priority cell for UE fulfilling low mobility criterion in the test case.

The cell re-selection delay to detected higher priority cell 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 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on Cell 1.

The cell re-selection delay to a detected higher priority cell test requirement for UE fulfilling low mobility criterion in this case is expressed as:

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

$T_{evaluate,NR\_Inter}$ = 15.36 s; as specified in TS 38.133 [6] Table 4.2.2.10.2-1.

T_{SI-NR} = 1.28 s; 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 16.64 s, allow 17 s for the cell re-selection delay to an already detected higher 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%.

6.1.1.6 NR SA FR1-FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

6.1.1.6.1 Test purpose

The purpose of this test is to verify the requirement for the inter-frequency NR cell reselection requirements for UE fulfilling not-at-cell edge criterion specified in TS 38.133 [6] clause 4.2.2.10.3.

6.1.1.6.2 Test applicability

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

6.1.1.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.1.6.

6.1.1.6.4 Test description

6.1.1.6.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 6.1.1.6.4.1-1.

Table 6.1.1.6.4.1-1: Supported test configurations for NR SA FR1-FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion

Configuration	Description of serving cell	Description of target cell
6.1.1.6-1	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.1.1.6-2	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6.1.1.6-3	30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode	30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.		

Configure the test equipment and the DUT according to the parameters in Table 6.1.1.6.4.1-2.

Table 6.1.1.6.4.1-2: Initial conditions for NR SA FR1-FR1 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 6.1.1.6.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part.		

1. The general test parameter settings are set up according to Table 6.1.1.6.4.1-3.

2. Message contents are defined in clause 6.1.1.6.4.3.

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

Table 6.1.1.6.4.1-3: General test parameters for NR SA FR1-FR1 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, 3	Cell2	The UE camps on cell 2 in the initial phase, it fulfils Not-at-cell edge relaxation measurements criterion, and during T1 period the UE reselects to cell 1
	Neighbour cells		1, 2, 3	Cell1	
T1 end condition	Active cell		1, 2, 3	Cell1	The UE shall perform reselection to cell 1 during T1
	Neighbour cells		1, 2, 3	Cell2	
T2 end condition	Active cell		1, 2, 3	Cell2	The UE shall perform reselection to cell 2 with higher priority during T2
	Neighbour cells		1, 2, 3	Cell1	
RF Channel Number			1, 2, 3	1, 2	
Time offset between cells			1	3 ms	Asynchronous cells
			2	3 μs	Synchronous cells
			3	3 μs	Synchronous cells
Access Barring Information		-	1, 2, 3	Not Sent	No additional delays in random access procedure.
SSB Configuration			1	SSB.1 FR1	
			2	SSB.1 FR1	
			3	SSB.2 FR1	
SMTC configuration			1	SMTC pattern 2	Configured in SIB4 of Cell 1
				SMTC pattern 6	Configured in SIB4 of Cell 2
			2	SMTC pattern 1	
			3	SMTC pattern 1	
DRX cycle length		s	1, 2, 3	0.64	The value shall be used for all cells in the test.
PRACH configuration index			1, 2, 3	102	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
rangeToBestCell			1, 2, 3	Not configured	
T1		s	1, 2, 3	20 s	T1 is defined so that cell re-selection reaction time is taken into account.
T2		s	1, 2, 3	20 s	T2 is defined so that cell re-selection reaction time is taken into account.

6.1.1.6.4.2 Test procedure

Two cells are deployed in the test, which are FR1 NR Cell 1 and Cell 2 on different frequencies. The test consists of 2 successive time periods, with time duration of T1, and 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. 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 *RRCSetupRequest* message to perform a Registration procedure for mobility.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* with Test Mode *On* according to TS 38.508-1 [14] clause 4.5 on Cell 2. SIB2 of Cell 1 and Cell 2 are configured as follows:

    -   *cellEdgeEvaluation-r16* is configured according to the parameters listed in Table 6.1.1.6.5-1.

    -   *lowMobilityEvaluation-r16* and *combineRelaxedMeasCondition* are not configured.

2. Set the parameters according to T1 in Table 6.1.1.6.5-1. 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 Cell 1 within 17 seconds from the beginning of time period T1, then count a success for the event "Re-select Cell 1". Otherwise count a fail for the event "Re-select 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 T2 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.

6. 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 6.1.1.6.5-1. T2 starts.

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

9. If the UE responds on Cell 2 within 17 seconds from the beginning of time period T2, then count a success for the event "Re-select Cell 2". Otherwise count a fail for the event "Re-select Cell 2".

10. If the UE has re-selected Cell 2 within T2, after the re-selection or when T2 expires, continue with step 11. 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.

11. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2. skip to 13

12. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 in Cell 2.

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

6.1.1.6.4.3 Message contents

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

Table 6.1.1.6.4.3-1: SIB1 (Cell 1 and Cell 2)

Derivation Path: TS 38.508-1 [14], Table 4.6.1-28			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB1 ::= SEQUENCE {			
servingCellConfigCommon SEQUENCE {			
downlinkConfigCommon SEQUENCE {			
pcch-Config SEQUENCE {			
defaultPagingCycle	rf64		
}			
}			
}			
}			

Table 6.1.1.6.4.3-2: SIB2 (Cell 1)

Derivation Path: Table H.2.2-1			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB2 ::= SEQUENCE {			
cellReselectionServingFreqInfo SEQUENCE {			
s-NonIntraSearchP	Not present		
}			
relaxedMeasurement-r16 SEQUENCE {			
lowMobilityEvaluation-r16	Not present		
cellEdgeEvaluation-r16 SEQUENCE {	Not present		
s-SearchThresholdP-r16	25	Actual value = 25*2 = 50dB	
s-SearchThresholdQ-r16	Not present		
}			
combineRelaxedMeasCondition-r16	Not present		
highPriorityMeasRelax-r16	Not present		
}			
}			

Table 6.1.1.6.4.3-3: SIB2 (Cell 2)

Derivation Path: Table H.2.2-1			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB2 ::= SEQUENCE {			
cellReselectionServingFreqInfo SEQUENCE {			
s-NonIntraSearchP	Not present		
}			
relaxedMeasurement-r16 SEQUENCE {			
lowMobilityEvaluation-r16	Not present		
cellEdgeEvaluation-r16 SEQUENCE {	Not present		
s-SearchThresholdP-r16	17	Actual value = 17*2 = 34dB	
s-SearchThresholdQ-r16	Not present		
}			
combineRelaxedMeasCondition-r16	Not present		
highPriorityMeasRelax-r16	Not present		
}			
}			

Table 6.1.1.6.4.3-4: SIB4 (Cell 1)

Derivation Path: Table H.2.2-2			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB4 ::= SEQUENCE {			
interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo {	1 entry		
InterFreqCarrierFreqInfo[1] SEQUENCE {		entry 1	
dl-CarrierFreq	ARFCN-ValueNR for Cell 2 SSB		
smtc	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2		6.1.1.6-1
	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1		6.1.1.6-2, 6.1.1.6-3
deriveSSB-IndexFromCell	false		6.1.1.6-1
	true		6.1.1.6-2, 6.1.1.6-3
cellReselectionPriority	5	Same as the priority in SIB 2 of Cell 2.	
}			
}			
}			

Table 6.1.1.6.4.3-5: SIB4 (Cell 2)

Derivation Path: Table H.2.2-2			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB4 ::= SEQUENCE {			
interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo {	1 entry		
InterFreqCarrierFreqInfo[1] SEQUENCE {		entry 1	
dl-CarrierFreq	ARFCN-ValueNR for Cell 1 SSB		
smtc	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.6		6.1.1.6-1
	SSB-MTC specified in 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1		6.1.1.6-2, 6.1.1.6-3
deriveSSB-IndexFromCell	false		6.1.1.6-1
	true		6.1.1.6-2, 6.1.1.6-3
cellReselectionPriority	4	Same as the priority in SIB 2 of Cell 1.	Cell 2
}			
}			
}			

6.1.1.6.5 Test requirement

Tables 6.1.1.6.4.1-3 and 6.1.1.6.5-1 define the primary level settings including test tolerances for NR SA FR1-FR1 cell re-selection for UE fulfilling not-at-cell edge relaxed measurement criterion test case.

Table 6.1.1.6.5-1: Cell specific test parameters for NR SA FR1-FR1 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	N/A		N/A	
		2	TDDConf.1.1		TDDConf.1.1	
		3	TDDConf.2.1		TDDConf.2.1	
PDSCH RMC configuration		1	SR.1.1 FDD		SR.1.1 FDD	
		2	SR.1.1 TDD		SR.1.1 TDD	
		3	SR.2.1 TDD		SR.2.1 TDD	
RMSI CORESET RMC configuration		1	CR.1.1 FDD		CR.1.1 FDD	
		2	CR.1.1 TDD		CR.1.1 TDD	
		3	CR.2.1 TDD		CR.2.1 TDD	
Dedicated CORESET RMC configuration		1	CCR.1.1 FDD		CCR.1.1 FDD	
		2	CCR.1.1 TDD		CCR.1.1 TDD	
		3	CCR.2.1 TDD		CCR.2.1 TDD	
OCNG Pattern		1, 2, 3	OP.1 defined in A.3.2.1		OP.1 defined in A.3.2.1	
Initial DL BWP configuration		1, 2, 3	DLBWP.0.1		DLBWP.0.1	
Initial UL BWP configuration		1, 2, 3	ULBWP.0.1		ULBWP.0.1	
RLM-RS		1, 2, 3	SSB		SSB	
Qrxlevmin	dBm/SCS	1, 2	-140		-140	
		3	-137		-137	
Pcompensation	dB	1, 2, 3	0		0	
Qhyst$_s$	dB	1, 2, 3	0		0	
Qoffset$_{s, n}$	dB	1, 2, 3	0		0	
Cell_selection_and_reselection_quality_measurement		1, 2, 3	SS-RSRP		SS-RSRP	
$\hat{E}_s/I_{ot}$	dB	1	16	14	-3.65	16
		2				
		3				
N_{oc} Note2	dBm/SCS	1	-98		-100	
		2	-98		-100	
		3	-95		-97	
N_{oc} Note2	dBm/15 kHz	1	-98		-100	
		2				
		3				
$\hat{E}_s/N_{oc}$	dB	1	16	14	-3.65	16
		2				
		3				
SS-RSRP Note3	dBm/SCS	1	-82	-84	-103.65	-84
		2	-82	-84	-103.65	-84
		3	-79	-81	-100.65	-81
Io	dBm/9.36 MHz	1	-53.94	-55.88	-70.49	-55.94
	dBm/9.36 MHz	2	-53.94	-55.88	-70.49	-55.94
	dBm/38.16 MHz	3	-47.84	-49.79	-63.39	-49.84
Treselection	s	1, 2, 3	0	0	0	0
SnonintrasearchP	dB	1, 2, 3	Not sent		Not sent	
Thresh$_{x, highP}$	dB	1, 2, 3	48		48	
Thresh$_{serving, lowP}$	dB	1, 2, 3	44		44	

Parameter	Unit	Test configuration	Cell 1		Cell 2	
			T1	T2	T1	T2
Thresh$_{x, lowP}$	dB	1, 2, 3	50		50	
S$_{SearchDeltaP}$	dB	1, 2, 3	3		3	
T$_{SearchDeltaP}$	s	1, 2, 3	5		5	
Propagation Condition		1, 2, 3	AWGN			
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.						
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.						
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.						

The cell re-selection delay to detected lower priority cell 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 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on Cell 2.

The cell re-selection delay to a detected cell test requirement for UE fulfilling not-at-cell edge criterion in this case is expressed as:

Cell re-selection delay to a detected lower priority cell = T$_{evaluate,NR\_Inter}$ + T$_{SI-NR}$

T$_{evaluate,NR\_Inter}$ = 15.36 s; as specified in TS 38.133 [6] Table 4.2.2.10.2-1.

T$_{SI-NR}$ = 1.28 s; 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 16.64 s, allow 17 s for the cell re-selection delay to an already detected lower priority cell for UE fulfilling not-at-cell edge criterion in the test case.

The cell re-selection delay to detected higher priority cell 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 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on Cell 1.

The cell re-selection delay to a detected higher priority cell test requirement for UE fulfilling not-at-cell edge criterion in this case is expressed as:

Cell re-selection delay to a detected higher priority cell = T$_{evaluate,NR\_Inter}$ + T$_{SI-NR}$

T$_{evaluate,NR\_Inter}$ = 15.36 s; as specified in TS 38.133 [6] Table 4.2.2.10.2-1.

T$_{SI-NR}$ = 1.28 s; 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 16.64 s, allow 17 s for the cell re-selection delay to an already detected higher 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%.

6.1.1.7 NR SA FR1 cell re-selection for UE configured with highSpeedMeasFlag-r16

6.1.1.7.1 Test purpose

The purpose of this test is to verify that when the current and target cell operates on the same carrier frequency the UE configured with *highSpeedMeasFlag-r16* is able to search and measure cells to meet the intra-frequency NR cell re-selection requirements.

6.1.1.7.2 Test applicability

This test applies to all types of NR UE from release 15 onwards that supports measurement enhancements in high speed scenario

6.1.1.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.1.7.

6.1.1.7.4 Test description

6.1.1.7.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 6.1.1.7.4.1-1.

Table 6.1.1.7.4.1-1: Supported test configurations for NR SA FR1 cell re-selection for UE configured with highSpeedMeasFlag-r16

Configuration	Description
6.1.1.7-1	15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
6.1.1.7-2	15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
6.1.1.7-3	30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note:	The UE is only required to be tested in one of the supported test configurations.

Configure the test equipment and the DUT according to the parameters in Table 6.1.1.7.4.1-2.

Table 6.1.1.7.4.1-2: Initial conditions for NR SA FR1 cell re-selection for UE configured with highSpeedMeasFlag-r16

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.1.1.7.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part.		

1. The general test parameter settings are set up according to Table 6.1.1.7.4.1-3.

2. Message contents are defined in clause 6.1.1.7.4.3.

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

Table 6.1.1.7.4.1-3: General test parameters for NR SA FR1 cell re-selection for UE configured with highSpeedMeasFlag-r16

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3	Cell1	
	Neighbour cells		1, 2, 3	Cell2	
T2 end condition	Active cell		1, 2, 3	Cell2	
	Neighbour cells		1, 2, 3	Cell1	

			1, 2, 3	Cell1	
Final condition	Active cell				
RF Channel Number			1, 2, 3	1	
Time offset between cells			1	3 ms	Asynchronous cells
			2	3 µs	Synchronous cells
			3	3 µs	Synchronous cells
Access Barring Information		-	1, 2, 3	Not Sent	No additional delays in random access procedure.
SSB configuration			1	SSB.1 FR1	
			2	SSB.1 FR1	
			3	SSB.2 FR1	
SMTC configuration			1	SMTC.2	Configured in SIB2 of Cell 1
				SMTC.6	Configured in SIB2 of Cell 2
			2	SMTC.1	
			3	SMTC.1	
DRX cycle length		s	1, 2, 3	0.32	The value shall be used for all cells in the test.
PRACH configuration index			1, 2, 3	102	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
rangeToBestCell			1, 2, 3	Not configured	
T1		s	1, 2, 3	>7	During T1, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed, The intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T2
T2		s	1, 2, 3	4	T2 needs to be defined so that cell re-selection reaction time is taken into account.
T3		s	1, 2, 3	3	T3 needs to be defined so that cell re-selection reaction time is taken into account.

6.1.1.7.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) and an NR neighbour cell (Cell 2) on the same frequency. 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. *highSpeedMeasFlag-r16* is broadcasted to UE.

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

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* with 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 6.1.1.7.5-1. 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 6.1.1.7.5-1. T2 starts.

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 4 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 6.1.1.7.5-1. T3 starts.

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 3 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* 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.

6.1.1.7.4.3 Message contents

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

Table 6.1.1.7.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks on condition of HighSpeedMeas with exceptions	Table H.2.1-1 with Condition SMTC.2 and Asynchronous cells for configuration 6.1.1.7-1 and Cell 1
	Table H.2.1-1 with Condition SMTC.6 and Asynchronous cells for configuration 6.1.1.7-1 and Cell 2
	Table H.2.1-1 with Condition SMTC.1 and synchronous cells for configuration 6.1.1.7-2
	Table H.2.1-1 with Condition SMTC.1 and synchronous cells for configuration 6.1.1.7-3
	Table H.2.1-2
	Table H.2.1-3 with Condition HighSpeedMeas
Default RRC messages and information elements contents exceptions	

6.1.1.7.5 Test requirement

Tables 6.1.1.7.4.1-3 and 6.1.1.7.5-1 define the primary level settings including test tolerances for intra frequency NR cell re-selection test case for UE configured with highSpeedMeasFlag-r16.

Table 6.1.1.7.5-1: Cell specific test parameters for intra frequency NR cell re-selection test case for UE configured with highSpeedMeasFlag-r16

Parameter	Unit	Test configuration	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
TDD configuration		1	N/A			N/A		
		2	TDDConf.1.1			TDDConf.1.1		
		3	TDDConf.2.1			TDDConf.2.1		
PDSCH RMC configuration		1	SR.1.1 FDD			SR.1.1 FDD		
		2	SR.1.1 TDD			SR.1.1 TDD		
		3	SR.2.1 TDD			SR.2.1 TDD		
RMSI CORESET RMC configuration		1	CR.1.1 FDD			CR.1.1 FDD		
		2	CR.1.1 TDD			CR.1.1 TDD		
		3	CR.2.1 TDD			CR.2.1 TDD		
Dedicated CORESET RMC configuration		1	CCR.1.1 FDD			CCR.1.1 FDD		
		2	CCR.1.1 TDD			CCR.1.1 TDD		
		3	CCR.2.1 TDD			CCR.2.1 TDD		
OCNG Pattern		1, 2, 3	OP.1 defined in A.2.1-1			OP.1 defined in A.2.1-1		
Initial DL BWP configuration		1, 2, 3	DLBWP.0.1			DLBWP.0.1		
Initial UL BWP configuration		1, 2, 3	ULBWP.0.1			ULBWP.0.1		
RLM-RS		1, 2, 3	SSB			SSB		
Qrxlevmin	dBm/SCS	1, 2	-140			-140		
		3	-137			-137		
Pcompensation	dB	1, 2, 3	0			0		
Qhyst$_s$	dB	1, 2, 3	0			0		
Qoffset$_{s, n}$	dB	1, 2, 3	0			0		
Cell_selection_and_ reselection_quality_m easurement		1, 2, 3	SS-RSRP			SS-RSRP		
$\hat{E}_s/I_{ot}$	dB	1	16	-3.55	3.24	-infinity	3.24	-3.55
		2						
		3						
N_{oc} Note2	dBm/SCS	1	-98					
		2	-98					
		3	-95					
N_{oc} Note2	dBm/15 kHz	1	-98					
		2						
		3						
$\hat{E}_s / N_{oc}$	dB	1	16	13	16.45	-infinity	16.45	13
		2						
		3						
SS-RSRP Note3	dBm/SCS	1	-82	-85	81.55	-infinity	-81.55	-85
		2	-82	-85	-81.55	-infinity	-81.55	-85
		3	-79	-82	-78.54	-infinity	-78.54	-82
Io	dBm/9.36 MHz	1	-53.94	-51.91	-51.91	specified in Cell 1 columns-		
	dBm/9.36 MHz	2	-53.94	-51.91	-51.91			
	dBm/38.16 MHz	3	-47.85	-45.81	-45.81			
Treselection	s	1, 2, 3	0	0	0	0	0	0
SintrasearchP	dB	1, 2, 3	60			60		
Propagation Condition		1, 2	AWGN			AWGN 1944Hz Note4		
Propagation Condition		3	AWGN			AWGN 3334Hz Note5		

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: The AWGN 1944 Hz condition is a non-fading propagation channel with one tap. Doppler shift is a constant 1944 Hz.

Note 5: The AWGN 3334 Hz condition is a non-fading propagation channel with one tap. Doppler shift is a constant 3334 Hz.

The cell reselection delay to a newly detectable cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on Cell 2.

The cell re-selection delay to a newly detectable cell 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} = 2.56 s; as specified in Table 4.2.2.3-2 in clause 4.2.2.3 TS 38.133 [6].

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 3.84 seconds in this test case (note: this gives a total of 3.84 seconds but the test allows 4 seconds).

The cell reselection delay to an already detected cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Tracking Area Update procedure on cell 1.

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

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

$T_{evaluate,NR\_Intra}$ = 0.96 s; as specified in Table 4.2.2.3-2 in clause 4.2.2.3 TS 38.133 [6].

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 2.24 seconds in this test case (note: this gives a total of 2.24 seconds but the test allows 3 seconds).

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

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

6.1.2 NR – E-UTRA cell re-selection

6.1.2.0 Minimum conformance requirements

6.1.2.0.1 Minimum conformance requirements for NR – E-UTRA cell re-selection

The cell re-selection delay to a higher priority cell shall be less than $T_{higher\_priority\_search} + T_{evaluate, EUTRAN} + T_{SI-E-UTRA}$ in RRC_IDLE state.

The cell re-selection delay to a lower priority E-UTRA cell shall be less than $T_{evaluate, E-UTRAN} + T_{SI-E-UTRA}$ in RRC_IDLE state.

If $Srxlev > S_{nonIntraSearchP}$ and $Squal > S_{nonIntraSearchQ}$ then the UE shall search for inter-RAT E-UTRAN layers of higher priority at least every $T_{higher\_priority\_search}$ where $T_{higher\_priority\_search}$ is described in clause 4.2.2 of TS 38.133 [6].

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

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

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

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

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

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

- SCH conditions specified in TS 36.133 [15, Annex B.1.2] are fulfilled for a corresponding Band.

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

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

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

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

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

For a cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that an already identified inter-RAT E-UTRA cell has met reselection criterion defined in TS 38.304 [30] within $(N_{EUTRA\_carrier}) * T_{evaluate,EUTRAN}$ when $T_{reselection} = 0$ as specified in table 4.2.2.5-1 of TS 38.133 [6] provided that the reselection criteria is met by a margin of at least 6dB for RSRP reselections based on absolute priorities or 4dB for RSRQ reselections based on absolute priorities.

If $T_{reselection}$ timer has a non-zero value and the inter-RAT E-UTRA cell is satisfied with the reselection criteria which are defined in TS 38.304 [30], the UE shall evaluate this E-UTRA cell for the $T_{reselection}$ time. If this cell remains satisfied with the reselection criteria within this duration, then the UE shall reselect that cell.

The normative reference for this requirement is TS 38.133 [6] clause 4.2.2.5.

Table 6.1.2.0.1-1: $T_{detect,EUTRAN}$, $T_{measure,EUTRAN}$, and $T_{evaluate,EUTRAN}$

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

Table 6.1.2.0.1-2: $T_{detect,EUTRAN\_HST}$, $T_{measure,EUTRAN\_HST}$, and $T_{evaluate,EUTRAN\_HST}$ for UE configured with highSpeedMeasFlag-r16

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

The requirements in Table 6.1.2.0.1-2 apply only when the UE supports *measurementEnhancement-r16* or *interRAT-MeasurementEnhancement-r16*. For UE not supporting either *measurementEnhancement-r16* or *interRAT-MeasurementEnhancement-r16*, the UE is not required to meet the requirements specified in Table 6.1.2.0.1-2.

6.1.2.0.2 Minimum conformance requirement for inter-RAT E-UTRAN cells for UE configured with relaxed measurement criterion

6.1.2.0.2.1 Introduction

This clause contains the requirements for measurements on inter-RAT E-UTRAN cells when the UE is configured with any of 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.

6.1.2.0.2.2 Measurements for UE fulfilling low mobility criterion

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

- T331 timer is not running for EMR measurements on inter-RAT E-UTRAN, and

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

- UE is configured with both *lowMobilityEvalutation* [13] criterion and *cellEdgeEvaluation* [13] criterion and *combineRelaxedMeasCondition* [13] not configured, and

- UE has fulfilled only the *lowMobilityEvalutation* [13] criterion.

When Srxlev $\leq$ $S_{nonIntraSearchP}$ or Squal $\leq$ $S_{nonIntraSearchQ}$ then the requirements defined in clause 6.1.2.0.1 apply for this clause except that:

- $T_{detect,EUTRAN}$ as specified in Table 6.1.2.0.2.2-1.

- $T_{measure,EUTRAN}$ as specified in Table 6.1.2.0.2.2-1.

- $T_{evaluate,EUTRAN}$ as specified in Table 6.1.2.0.2.2-1.

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

Table 6.1.2.0.2.2-1: T$_{detect,EUTRAN}$, T$_{measure,EUTRAN}$, and T$_{evaluate,EUTRAN}$

DRX cycle length [s]	T$_{detect,EUTRAN}$ [s] (number of DRX cycles)	T$_{measure,EUTRAN}$ [s] (number of DRX cycles)	T$_{evaluate,EUTRAN}$ [s] (number of DRX cycles)
0.32	11.52 x K1 (36 x K1)	1.28 x K1 (4 x K1)	5.12 x K1 (16 x K1)
0.64	17.92 x K1 (28 x K1)	1.28 x K1 (2 x K1)	5.12 x K1 (8 x K1)
1.28	32 x K1 (25 x K1)	1.28 x K1 (1 x K1)	6.4 x K1 (5 x K1)
2.56	58.88 x K1 (23 x K1)	2.56 x K1 (1 x K1)	7.68 x K1 (3 x K1)
Note 1: K1 = 3 is the measurement relaxation factor applicable for UE fulfilling the *lowMobilityEvalutation* [13] criterion.			

6.1.2.0.2.3 Measurements for UE fulfilling with not-at-cell edge criterion

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

- T331 timer is not running for EMR measurements on inter-RAT E-UTRAN, and

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

- UE is configured with both *lowMobilityEvalutation* [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 the requirements defined in clause 6.1.2.0.1 apply for this clause except that:

- T$_{detect,EUTRAN}$ as specified in Table 6.1.2.0.2.3-1.

- T$_{measure,EUTRAN}$ as specified in Table 6.1.2.0.2.3-1.

- T$_{evaluate,EUTRAN}$ as specified in Table 6.1.2.0.2.3-1.

When Srxlev > S$_{nonIntraSearchP}$ and Squal > S$_{nonIntraSearchQ}$ and regardless of whether the UE is configured with *highPriorityMeasRelax* [13] or not, the UE shall search for inter-RAT E-UTRAN 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].

Table 6.1.2.0.2.3-1: T$_{detect,EUTRAN}$, T$_{measure,EUTRAN}$, and T$_{evaluate,EUTRAN}$

DRX cycle length [s]	T$_{detect,EUTRAN}$ [s] (number of DRX cycles)	T$_{measure,EUTRAN}$ [s] (number of DRX cycles)	T$_{evaluate,EUTRAN}$ [s] (number of DRX cycles)
0.32	11.52 x K1 (36 x K1)	1.28 x K1 (4 x K1)	5.12 x K1 (16 x K1)
0.64	17.92 x K1 (28 x K1)	1.28 x K1 (2 x K1)	5.12 x K1 (8 x K1)
1.28	32 x K1 (25 x K1)	1.28 x K1 (1 x K1)	6.4 x K1 (5 x K1)
2.56	58.88 x K1 (23 x K1)	2.56 x K1 (1 x K1)	7.68 x K1 (3 x K1)
Note 1: K1 = 3 is the measurement relaxation factor applicable for UE fulfilling the *lowMobilityEvalutation* [13] criterion.			

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

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

- T331 timer is not running for EMR measurements on inter-RAT E-UTRAN, and

- UE is configured with both *lowMobilityEvalutation* [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 $T_{detect,EUTRAN}$, $T_{measure,EUTRAN}$ and $T_{evaluate,EUTRAN}$ as defined in Table 6.1.2.0.1-1.

The normative reference for this requirement is TS 38.133 [6] clause 4.2.2.11.

6.1.2.1 NR SA FR1 – E-UTRA cell re-selection to higher priority E-UTRA

6.1.2.1.1 Test purpose

This test is to verify the requirement for the NR to E-UTRAN inter-RAT cell reselection requirements specified in clause 4.2.2.5 of TS 38.133 [6] when the E-UTRAN cell is of higher priority.

6.1.2.1.2 Test applicability

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

6.1.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.2.1.

6.1.2.1.4 Test description

6.1.2.1.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 6.1.2.1.4.1-1.

Table 6.1.2.1.4.1-1: Supported test configurations

Configuration	Description of serving cell	Description of target cell
6.1.2.1-1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	LTE 10MHz bandwidth, TDD duplex mode
6.1.2.1-2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	LTE 10MHz bandwidth, TDD duplex mode
6.1.2.1-3	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	LTE 10MHz bandwidth, TDD duplex mode
6.1.2.1-4	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	LTE 10MHz bandwidth, FDD duplex mode
6.1.2.1-5	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	LTE 10MHz bandwidth, FDD duplex mode
6.1.2.1-6	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	LTE 10MHz bandwidth, FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.		

Configure the test requirement and the DUT according to the parameters in Table 6.1.2.1.4.1-2.

Table 6.1.2.1.4.1-2: Initial conditions for NR SA FR1 – E-URTA cell re-selection to higher priority E-UTRA

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-2 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.1.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
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 6.1.2.1.4.1-3.

2. Message contents are defined in clause 6.1.2.1.4.3.

3. The test scenario comprises of one NR cell and one E-UTRAN cell. Cell 1 is the NR PCell and Cell 2 is the E-UTRA neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1.

Table 6.1.2.1.4.1-3: General test parameters for NR to higher priority E-UTRAN cell re-selection test case

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3, 4, 5, 6	Cell1	The UE camps on cell 1 in the initial phase and during T2 period the UE reselects to cell 2.
T2 end condition	Active cell		1, 2, 3, 4, 5, 6	Cell2	The UE shall perform reselection to cell 2 during T2.
	Neighbour cell		1, 2, 3, 4, 5, 6	Cell1	
T3 end condition	Active cell		1, 2, 3, 4, 5, 6	Cell1	The UE shall perform reselection to cell 1 during T3 for iteration of the tests.
	Neighbour cell		1, 2, 3, 4, 5, 6	Cell2	
Access Barring Information		-	1, 2, 3, 4, 5, 6	Not Sent	No additional delays in random access procedure.
DRX cycle length		s	1, 2, 3, 4, 5, 6	1.28	The value shall be used for all cells in the test.
NR PRACH configuration index			1, 2, 3, 4, 5, 6	102	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
E-UTRAN PRACH configuration index			1, 2, 3	53	As specified in table 5.7.1-2 in TS 36.211
			4, 5, 6	4	
T1		s	1, 2, 3, 4, 5, 6	>7	During T1, cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that cell 2 has not been detected by the UE prior to the start of period T2.
T2		s	1, 2, 3, 4, 5, 6	75	T2 needs to be defined so that cell re-selection reaction time is taken into account.
T3		s	1, 2, 3, 4, 5, 6	15	T3 needs to be defined so that cell re-selection reaction time is taken into account.

6.1.2.1.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) and an E-UTRA neighbour cell (Cell 2). The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. NR cell 1 is already identified by the UE prior to the start of the test. E-UTRAN cell 2 is of higher priority than cell 1.

Before T1 the UE is camped on to cell 1. During T1, cell 2 shall be powered off. At the start of T2 the UE is expected to detect cell 2, send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on cell 2. At the start of T3 cell 2 becomes weaker than cell 1, and the UE reselects to Cell 1.

In the following test procedure "UE responds" means "UE starts transmitting preamble on PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure.

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

2. Set the parameters according to T1 in Table 6.1.2.1.5-1 and 6.1.2.1.5-2. T1 starts.

3. During T1, Cell 2 shall be powered off and set Cell 2 physical cell identity = ((current Cell 2 physical cell identity + 1) mod 14 + 2) for one iteration of the test procedure loop.

4. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.1.2.1.5-1 and 6.1.2.1.5-2. T2 starts.

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

6. If the UE responds on Cell 2 during time duration T2 within 68 seconds from the beginning of time period T2, then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

7. If the UE has re-selected Cell 2 within T2, after the re-selection or when T2 expires, continue with step 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 11.

7a The SS shall send an *RRCConnectionRelease* 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 6.1.2.1.5-1 and 6.1.2.1.5-2. T3 starts.

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

10. If the UE has re-selected Cell 1 within T3, after the re-selection or when T3 expires, continue with step 10a. 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 11.

10a. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.

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

12. Repeat step 2-11 until a test verdict has been achieved.

6.1.2.1.4.3 Message contents

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

Table 6.1.2.1.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	Table H.2.3-1 Table H.2.3-2 with Condition SMTC 1 and higher priority for configuration 6.1.2.1-2, 6.1.2.1-3, 6.1.2.1-5 and 6.1.2.1-6 Table H.2.3-2 with Condition SMTC 2 and higher priority for configuration 6.1.2.1-1 and 6.1.2.1-4 Table H.2.3-3 with Condition higher priority
Default RRC messages and information elements contents exceptions	

Table 6.1.2.1.4.3-2: SystemInformationBlockType3

Derivation Path: TS 36.508 [25] Table 4.4.3.3-2			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType3 ::= SEQUENCE {			
cellReselectionServingFreqInfo SEQUENCE {			
threshServingLow	22	Actual value = 44 dB	
cellReselectionPriority	5		higher priority E-UTRA
}			
}			

Table 6.1.2.1.4.3-3: SystemInformationBlockType24

Information Element	Value/remark	Comment	Condition
Derivation Path: TS 36.508 [25] Table 4.4.3.3-20			
SystemInformationBlockType24-r15 ::= SEQUENCE {			
carrierFreqListNR-r15 SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE {	1 entry		
cellReselectionPriority-r15[*n*]	4		higher priority E-UTRA
threshX-High-r15[1]	24	Actual value = 48 dB	
threshX-Low-r15[1]	25	Actual value = 50 dB	
}			
}			

6.1.2.1.5 Test requirement

Tables 6.1.2.1.4.1-3, 6.1.2.1.5-1 and 6.1.2.1.5-2 define the primary level settings including test tolerances for higher priority E-UTRA cell re-selection test case.

Table 6.1.2.1.5-1: Cell specific test parameters for NR cell 1

Parameter	Unit	Test configuration	Cell 1		
			T1	T2	T3
TDD configuration		1, 4	N/A		
		2, 5	TDDConf.1.1		
		3, 6	TDDConf.2.1		
PDSCH parameters		1, 4	SR.1.1 FDD		
		2, 5	SR.1.1 TDD		
		3, 6	SR.2.1 TDD		
RMSI CORESET parameters		1, 4	CR.1.1 FDD		
		2, 5	CR.1.1 TDD		
		3, 6	CR.2.1 TDD		
Dedicated CORESET parameters		1, 4	CCR.1.1 FDD		
		2, 5	CCR.1.1 TDD		
		3, 6	CCR.2.1 TDD		
SSB parameters		1, 4	SSB.1 FR1		
		2, 5	SSB.1 FR1		
		3, 6	SSB.2 FR1		
NR SMTC parameters		1, 4	SMTC 2		
		2, 5	SMTC 1		
		3, 6	SMTC 1		
OCNG Pattern		1, 2, 3, 4, 5, 6	OP.1 defined in A.2.1-1		
Initial DL BWP configuration		1, 2, 3, 4, 5, 6	DLBWP.0.1		
Initial UL BWP configuration		1, 2, 3, 4, 5, 6	ULBWP.0.1		
RLM-RS		1, 2, 3, 4, 5, 6	SSB		
Qrxlevmin	dBm/SCS	1, 2, 4, 5	-140		
		3, 6	-137		
N_{oc}	dBm/SCS	1, 4	-98		
		2, 5	-98		
		3, 6	-95		
N_{oc}	dBm/15 kHz	1, 2, 3, 4, 5, 6	-98		
SS-RSRP	dBm/SCS	1, 4	-84	-82.4	-82.4
		2, 5	-84	-82.4	-82.4
		3, 6	-81	-79.39	-79.39
$\hat{E}_s / I_{ot}$	dB	1, 4	14	15.6	15.6
		2, 5			
		3, 6			
$\hat{E}_s / N_{oc}$	dB	1, 4	14	15.6	15.6
		2, 5			
		3, 6			
Io	dBm/9.36 MHz	1, 4	-55.88	-54.33	-54.33
	dBm/9.36 MHz	2, 5	-55.88	-54.33	-54.33

Parameter	Unit	Test configuration	Cell 1		
			T1	T2	T3
	dBm/38.16 MHz	3, 6	-49.79	-48.23	-48.23
Treselection	S	1, 2, 3, 4, 5, 6	0		
SnonintrasearchP	dB	1, 2, 3, 4, 5, 6	50		
Thresh_{x, highP (Note 2)}	dB	1, 2, 3, 4, 5, 6	48		
Thresh_{serving, lowP}	dB	1, 2, 3, 4, 5, 6	44		
Thresh_{x, lowP}	dB	1, 2, 3, 4, 5, 6	50		
Propagation Condition		1, 2, 3, 4, 5, 6	AWGN		
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.					
Note 2: This refers to the value of threshX-High which is included in NR system information, and is a threshold for the E-UTRA target cell.					

Table 6.1.2.1.5-2: Cell specific test parameters for E-UTRA cell 2

Parameter	Unit	Cell 2		
		T1	T2	T3
E-UTRA RF Channel number		1		
BW_{channel}	MHz	10		
OCNG Patterns defined in TS 36.133 clause A.3.2		OP.2 TDD for test configuration 1, 2, 3; OP.2 FDD for test configuration 4, 5, 6		
PBCH_RA	dB	0		
PBCH_RB	dB			
PSS_RA	dB			
SSS_RA	dB			
PCFICH_RB	dB			
PHICH_RA	dB			
PHICH_RB	dB			
PDCCH_RA	dB			
PDCCH_RB	dB			
PDSCH_RA	dB			
PDSCH_RB	dB			
OCNG_RA^{Note 1}	dB			
OCNG_RB^{Note 1}	dB			
Qrxlevmin	dBm	-140		
N_{oc}	dBm/15 kHz	-98	-98	-100
RSRP	dBm/15 KHz	-infinity	-84.4	-103.6
$\hat{E}_s/I_{ot}$	dB	-infinity	13.6	-3.6
$\hat{E}_s/N_{oc}$	dB	-infinity	13.6	-3.6
Treselection_{EUTRAN}	S	0		
SnonintrasearchP	dB	Not sent		
Thresh_{x, highP}	dB	48		
Thresh_{serving, lowP}	dB	44		
Thresh_{x, lowP (Note 2)}	dB	50		
Propagation Condition		AWGN		
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.				
Note 2: This refers to the value of threshX-Low-r15 which is included in E-UTRA system information, and is a threshold for the NR target cell.				

The cell reselection delay to a higher priority E-UTRAN cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to a higher priority cell shall be less than 68 s.

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

NOTE: The cell re-selection delay to a higher priority cell can be expressed as: $T_{higher\_priority\_search} + T_{evaluate,\ E-UTRAN} + T_{SI-E-UTRA}$,

Where:

$T_{higher\_priority\_search}$ See clause 4.2.2.7 of TS 38.133 [6]

$T_{evaluate,\ E-UTRAN}$ See Table 4.2.2.5-1 in clause 4.2.2.5 of TS 38.133 [6]

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

This gives a total of 67.68 s, allow 68 s for the cell re-selection delay to a higher priority E-UTRAN cell.

6.1.2.2　　NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRA

6.1.2.2.1　　Test purpose

This test is to verify the requirement for the NR to E-UTRAN inter-RAT cell reselection requirements specified in clause 4.2.2.5 of TS 38.133 [6] when the E-UTRAN cell is of lower priority.

6.1.2.2.2　　Test applicability

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

6.1.2.2.3　　Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.2.2.

6.1.2.2.4　　Test description

6.1.2.2.4.1　　Initial conditions

The Test shall be tested using any of the test configuration in Table 6.1.2.2.4.1-1.

Table 6.1.2.2.4.1-1: Supported test configurations

Configuration	Description of serving cell	Description of target cell
6.1.2.2-1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	LTE 10MHz bandwidth, TDD duplex mode
6.1.2.2-2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	LTE 10MHz bandwidth, TDD duplex mode
6.1.2.2-3	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	LTE 10MHz bandwidth, TDD duplex mode
6.1.2.2-4	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	LTE 10MHz bandwidth, FDD duplex mode
6.1.2.2-5	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	LTE 10MHz bandwidth, FDD duplex mode
6.1.2.2-6	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	LTE 10MHz bandwidth, FDD duplex mode
Note:	The UE is only required to be tested in one of the supported test configurations.	

Configure the test equirement and the DUT according to the parameters in Table 6.1.2.2.4.1-2.

Table 6.1.2.2.4.1-2: Initial conditions for NR SA FR1 – E-URTA cell re-selection to lower priority E-UTRA

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.1.2.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
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 6.1.2.2.4.1-3.

2. Message contents are defined in clause 6.1.2.2.4.3.

3. The test scenario comprises of one NR cell and one E-UTRAN cell. Cell 1 is the NR PCell and Cell 2 is the E-UTRA neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1.

Table 6.1.2.2.4.1-3: General test parameters for NR to lower priority E-UTRAN cell re-selection test case

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3, 4, 5, 6	Cell1	The UE camps on cell 1 in the initial phase.
	Neighbour cell		1, 2, 3, 4, 5, 6	Cell2	
T1 end condition	Active cell		1, 2, 3, 4, 5, 6	Cell2	The UE shall perform reselection to cell 2 during T1.
	Neighbour cell		1, 2, 3, 4, 5, 6	Cell1	
T2 end condition	Active cell		1, 2, 3, 4, 5, 6	Cell1	The UE shall perform reselection to cell 1 during T2 for iteration of the tests.
	Neighbour cell		1, 2, 3, 4, 5, 6	Cell2	
Access Barring Information		-	1, 2, 3, 4, 5, 6	Not Sent	No additional delays in random access procedure.
DRX cycle length		s	1, 2, 3, 4, 5, 6	1.28	The value shall be used for all cells in the test.
NR PRACH configuration index			1, 2, 3, 4, 5, 6	102	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
E-UTRAN PRACH configuration index			1, 2, 3	53	As specified in table 5.7.1-2 in TS 36.211
			4, 5, 6	4	
T1		s	1, 2, 3, 4, 5, 6	15	T1 needs to be defined so that cell re-selection reaction time is taken into account.
T2		s	1, 2, 3, 4, 5, 6	75	T2 needs to be defined so that cell re-selection reaction time is taken into account.

6.1.2.2.4.2   Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) and an E-UTRA neighbour cell (Cell 2). The test consists of two successive time periods, with time duration of T1 and T2 respectively. Both NR cell 1 and E-UTRAN cell 2 are already identified by the UE prior to the start of the test. E-UTRAN cell 2 is of lower priority than cell 1.

The cell reselection delay to a lower priority E-UTRAN cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on cell 2.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 on Cell 1.

1a. Set the parameters according to T2 in Table 6.1.2.2.5-1 and 6.1.2.2.5-2. SS waits at least for 32sec($T_{detect,EUTRAN}$) to ensure the UE can detect E-UTRA neighbor cell(Cell2).

2. Set the parameters according to T1 in Table 6.1.2.2.5-1 and 6.1.2.2.5-2. T1 starts.

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

4. If the UE responds on Cell 2 during time duration T1 within 8 seconds from the beginning of time period T1 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

5. If the UE has re-selected Cell 2 within T1, after the re-selection or when T1 expires, continue with step 5a. 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 9.

5a The SS shall send an *RRCConnectionRelease* message to ensure that the UE is in state RRC_IDLE on Cell 2.

6. The SS shall switch the power setting from T1 to T2 as specified in Table 6.1.2.2.5-1 and 6.1.2.2.5-2. T2 starts.

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

8. If the UE has re-selected Cell 1 within T2, after the re-selection or when T2 expires, continue with step 8a. Otherwise, if T2 expires and the UE has not yet re-selected Cell 1, the TE shall switch on and off the UE and skip to step 9.

8a. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1.

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

9a. Set the parameters according to T2 in Table 6.1.2.2.5-1 and 6.1.2.2.5-2. SS waits at least for 32sec($T_{detect,EUTRAN}$) to ensure the UE can detect E-UTRA neighbor cell(Cell2).

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

6.1.2.2.4.3 Message contents

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

Table 6.1.2.2.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	Table H.2.3-1 Table H.2.3-3 with Condition lower priority
Default RRC messages and information elements contents exceptions	

Table 6.1.2.2.4.3-1A: SIB2

Derivation Path: Table H.2.3-2 with condition lower priority			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB2 ::= SEQUENCE {			
cellReselectionServingFreqInfo SEQUENCE {			
s-NonIntraSearchP	Not present	UE applies the default value of infinity	
}			
intraFreqCellReselectionInfo SEQUENCE {			
smtc	SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1		6.1.2.2-2, 6.1.2.2-3, 6.1.2.2-5, 6.1.2.2-6
	SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.2		6.1.2.2-1, 6.1.2.2-4,
}			

}			

Table 6.1.2.2.4.3-2: SystemInformationBlockType3

Derivation Path: TS 36.508 [25] Table 4.4.3.3-2			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType3 ::= SEQUENCE {			
cellReselectionServingFreqInfo SEQUENCE {			
threshServingLow	22	Actual value = 44 dB	
cellReselectionPriority	4		lower priority E-UTRA
}			
}			

Table 6.1.2.2.4.3-3: SystemInformationBlockType24

Derivation Path: TS 36.508 [25] Table 4.4.3.3-20			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType24-r15 ::= SEQUENCE {			
carrierFreqListNR-r15 SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE {	1 entry		
cellReselectionPriority-r15[*n*]	5		lower priority E-UTRA
threshX-High-r15[1]	24	Actual value = 48 dB	
threshX-Low-r15[1]	25	Actual value = 50 dB	
}			
}			

6.1.2.2.5   Test requirement

Tables 6.1.2.2.4.1-3, 6.1.2.2.5-1 and 6.1.2.2.5-2 define the primary level settings including test tolerances for lower priority E-UTRA cell re-selection test case.

Table 6.1.2.2.5-1: Cell specific test parameters for NR cell 1

Parameter	Unit	Test configuration	Cell 1	
			T1	**T2**
TDD configuration		1, 4	N/A	
		2, 5	TDDConf.1.1	
		3, 6	TDDConf.2.1	
PDSCH RMC configuration		1, 4	SR.1.1 FDD	
		2, 5	SR.1.1 TDD	
		3, 6	SR.2.1 TDD	
RMSI CORESET RMC configuration		1, 4	CR.1.1 FDD	
		2, 5	CR.1.1 TDD	
		3, 6	CR.2.1 TDD	
Dedicated CORESET RMC configuration		1, 4	CCR.1.1 FDD	
		2, 5	CCR.1.1 TDD	
		3, 6	CCR.2.1 TDD	
SSB configuration		1, 4	SSB.1 FR1	
		2, 5	SSB.1 FR1	
		3, 6	SSB.2 FR1	
SMTC configuration		1, 4	SMTC pattern 2	
		2, 5	SMTC pattern 1	
		3, 6	SMTC pattern 1	
OCNG Pattern		1, 2, 3, 4, 5, 6	OP.1 defined in A.2.1-1	
Initial DL BWP configuration		1, 2, 3, 4, 5, 6	DLBWP.0.1	
Initial UL BWP configuration		1, 2, 3, 4, 5, 6	ULBWP.0.1	
RLM-RS		1, 2, 3, 4, 5, 6	SSB	
Qrxlevmin	dBm/SCS	1, 2, 4, 5	-140	
		3, 6	-137	
N_{oc}	dBm/SCS	1, 4	-100	-98
		2, 5	-100	-98
		3, 6	-97	-95
N_{oc}	dBm/15 kHz	1, 2, 3, 4, 5, 6	-100	-98
SS-RSRP	dBm/SCS	1, 4	-103.6	-84.4
		2, 5	-103.6	-84.4
		3, 6	-100.59	-81.39
$\hat{E}_s / I_{ot}$	dB	1, 4	-3.6	13.6
		2, 5		
		3, 6		
$\hat{E}_s / N_{oc}$	dB	1, 4	-3.6	13.6
		2, 5		
		3, 6		
Io	dBm/9.36 MHz	1, 4	-70.46	-56.26
	dBm/9.36 MHz	2, 5	-70.46	-56.26
	dBm/38.16 MHz	3, 6	-64.38	-50.16
Treselection	S	1, 2, 3, 4, 5, 6	0	
SnonintrasearchP	dB	1, 2, 3, 4, 5, 6	Not sent	
Thresh$_{x, highP}$	dB	1, 2, 3, 4, 5, 6	48	
Thresh$_{serving, lowP}$	dB	1, 2, 3, 4, 5, 6	44	
Thresh$_{x, low P}$ (Note 2)	dB	1, 2, 3, 4, 5, 6	50	
Propagation Condition		1, 2, 3, 4, 5, 6	AWGN	
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.				
Note 2: This refers to the value of Thresh$_{x, LowP}$ which is included in NR system information, and is a threshold for the E-UTRA target cell				

Table 6.1.2.2.5-2: Cell specific test parameters for E-UTRA cell 2

Parameter	Unit	Cell 2	
		T1	T2 T3
E-UTRA RF Channel number		1	
BW$_{channel}$	MHz	10	
OCNG Patterns defined in TS 36.133 clause A.3.2		OP.2 TDD for test configuration 1, 2, 3; OP.2 FDD for test configuration 4, 5, 6	
PBCH_RA	dB	0	
PBCH_RB	dB		
PSS_RA	dB		
SSS_RA	dB		
PCFICH_RB	dB		
PHICH_RA	dB		
PHICH_RB	dB		
PDCCH_RA	dB		
PDCCH_RB	dB		
PDSCH_RA	dB		
PDSCH_RB	dB		
OCNG_RA$^{Note 1}$	dB		
OCNG_RB$^{Note 1}$	dB		
Qrxlevmin	dBm	-140	
N_{oc}	dBm/15 kHz	-98	
RSRP	dBm/15 KHz	-82.4	-84
$\hat{E}_s/I_{ot}$	dB	15.6	14
$\hat{E}_s/N_{oc}$	dB	15.6	14
Treselection$_{EUTRAN}$	S	0	
SnonintrasearchP	dB	Not sent	
Thresh$_{x, highP}$ (Note 2)	dB	48	
Thresh$_{serving, lowP}$	dB	44	
Thresh$_{x, lowP}$	dB	50	
Propagation Condition		AWGN	
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. Note 2: This refers to the value of Thresh$_{x, highP}$ which is included in E-UTRA system information, and is a threshold for the NR target cell			

The cell reselection delay to a lower priority E-UTRAN cell is defined as the time from the beginning of time period T1, to the moment when the UE camps on cell 2, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to a lower priority cell shall be less than 8 s.

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

NOTE: The cell re-selection delay to a lower priority cell can be expressed as: T$_{evaluate, E-UTRAN}$ + T$_{SI-E-UTRA}$,

Where:

T$_{evaluate, E-UTRAN}$ See Table 4.2.2.5-1 in clause 4.2.2.5 of TS 38.133 [6]

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

This gives a total of 7.68 s, allow 8 s for the cell re-selection delay to a lower priority E-UTRAN cell.

6.1.2.3 NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRAN for UE fulfilling low mobility relaxed measurement criterion

6.1.2.3.1 Test purpose

This test is to verify the requirement for the NR to E-UTRAN inter-RAT cell reselection when UE fulfils the low mobility criterion specified in clause 4.2.2.11.2 of TS 38.133 [6] and the E-UTRAN cell is of lower priority.

6.1.2.3.2 Test applicability

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

6.1.2.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.2.3.

6.1.2.3.4 Test description

6.1.2.3.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 6.1.2.3.4.1-1.

Table 6.1.2.3.4.1-1: Supported test configurations

Configuration	Description of serving cell	Description of target cell
6.1.2.3-1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	LTE 10MHz bandwidth, TDD duplex mode
6.1.2.3-2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	LTE 10MHz bandwidth, TDD duplex mode
6.1.2.3-3	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	LTE 10MHz bandwidth, TDD duplex mode
6.1.2.3-4	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	LTE 10MHz bandwidth, FDD duplex mode
6.1.2.3-5	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	LTE 10MHz bandwidth, FDD duplex mode
6.1.2.3-6	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	LTE 10MHz bandwidth, FDD duplex mode
Note:	The UE is only required to be tested in one of the supported test configurations.	

Configure the test requirement and the DUT according to the parameters in Table 6.1.2.3.4.1-2.

Table 6.1.2.3.4.1-2: Initial conditions for NR SA FR1 – E-URTA cell re-selection to lower priority E-UTRA 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 6.1.2.3.4.1-1.		
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 6.1.2.3.4.1-3.

2. Message contents are defined in clause 6.1.2.3.4.3.

3. The test scenario comprises of one NR cell and one E-UTRAN cell. Cell 1 is the NR PCell and Cell 2 is the E-UTRA neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1.

Table 6.1.2.3.4.1-3: General test parameters for NR to lower priority E-UTRAN cell re-selection test case

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3, 4, 5, 6	Cell1	The UE camps on cell 1 in the initial phase, it fulfils Low Mobility relaxation measurements criterion, and during T1 period the UE reselects to cell 2.
	Neighbour cell		1, 2, 3, 4, 5, 6	Cell2	
T1 end condition	Active cell		1, 2, 3, 4, 5, 6	Cell2	The UE shall perform reselection to cell 2 during T1.
	Neighbour cell		1, 2, 3, 4, 5, 6	Cell1	
T2 end condition	Active cell		1, 2, 3, 4, 5, 6	Cell1	The UE shall perform reselection to cell 1 with higher priority during T2 for iteration of the tests.
	Neighbour cell		1, 2, 3, 4, 5, 6	Cell2	
Access Barring Information		-	1, 2, 3, 4, 5, 6	Not Sent	No additional delays in random access procedure.
DRX cycle length		s	1, 2, 3, 4, 5, 6	0.64	The value shall be used for all cells in the test.
NR PRACH configuration index			1, 2, 3, 4, 5, 6	102	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
E-UTRAN PRACH configuration index			1, 2, 3	53	As specified in table 5.7.1-2 in TS 36.211
			4, 5, 6	4	
T1		s	1, 2, 3, 4, 5, 6	24	T1 needs to be defined so that cell re-selection reaction time is taken into account.
T2		s	1, 2, 3, 4, 5, 6	24	T2 needs to be defined so that cell re-selection reaction time is taken into account.

6.1.2.3.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) and an E-UTRA neighbour cell (Cell 2). The test consists of two successive time periods, with time duration of T1 and T2 respectively. Both NR cell 1 and E-UTRAN cell 2 are already identified by the UE prior to the start of the test. E-UTRAN cell 2 is of lower priority than cell 1.

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

- *lowMobilityEvalutation* [13] criterion is configured according to the parameters listed in Table 6.1.2.3.5-1;

- *cellEdgeEvaluation* [13] criterion is not configured;

- *combineRelaxedMeasCondition* [13] is not configured

The cell reselection delay to a lower priority E-UTRAN cell with 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 2, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on cell 2.

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

2. Set the parameters according to T1 in Table 6.1.2.3.5-1 and 6.1.2.3.5-2. T1 starts.

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

4. If the UE responds on Cell 2 during time duration T1 within 17 seconds from the beginning of time period T1 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

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 11.

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

7.   The SS shall switch the power setting from T1 to T2 as specified in Table 6.1.2.3.5-1 and 6.1.2.3.5-2. T2 starts.

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

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 skip to step 11.

10   The SS shall send an RRCConnectionRelease to ensure that the UE is in state RRC_IDLE, and then skip to step 12.

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

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

6.1.2.3.4.3   Message contents

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

Table 6.1.2.3.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	Table H.2.3-1 Table H.2.3-2 with Condition SMTC 1 and lower priority for configuration 6.1.2.3-2, 6.1.2.3-3, 6.1.2.3-5 and 6.1.2.3-6 Table H.2.3-2 with Condition SMTC 2 and lower priority for configuration 6.1.2.3-1 and 6.1.2.3-4 Table H.2.3-3 with Condition lower priority
Default RRC messages and information elements contents exceptions	Table H.3.2-1

Table 6.1.2.3.4.3-2: SIB2

Derivation Path: TS 38.508-1 [14] Table 4.6.2-1			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB2 ::= SEQUENCE {			
relaxedMeasurement-r16 SEQUENCE {			
lowMobilityEvaluation-r16 SEQUENCE {			
s-SearchDeltaP-r16	dB3		
t-SearchDeltaP-r16	s5		
}			
cellEdgeEvaluation-r16	Not present		
combineRelaxedMeasCondition-r16	Not present		
highPriorityMeasRelax-r16	Not present		
}			
}			

Table 6.1.2.3.4.3-3: SystemInformationBlockType3

Derivation Path: TS 36.508 [25] Table 4.4.3.3-2			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType3 ::= SEQUENCE {			
relaxedMeasurement-r16 SEQUENCE {			
threshServingLow	22	Actual value = 44 dB	
cellReselectionPriority	4		lower priority E-UTRA
}			
}			

Table 6.1.2.3.4.3-4: SystemInformationBlockType24

Information Element	Value/remark	Comment	Condition
Derivation Path: TS 36.508 [25] Table 4.4.3.3-20			
SystemInformationBlockType24-r15 ::= SEQUENCE {			
carrierFreqListNR-r15 SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE {	1 entry		
cellReselectionPriority-r15[*n*]	5		lower priority E-UTRA
threshX-High-r15[1]	24	Actual value = 48 dB	
threshX-Low-r15[1]	25	Actual value = 50 dB	
}			
}			

6.1.2.3.5   Test requirement

Tables 6.1.2.3.4.1-3, 6.1.2.3.5-1 and 6.1.2.3.5-2 define the primary level settings including test tolerances for lower priority E-UTRA cell re-selection test case.

Table 6.1.2.3.5-1: Cell specific test parameters for NR cell 1

Parameter	Unit	Test configuration	Cell 1	
			T1	T2
TDD configuration		1, 4	N/A	
		2, 5	TDDConf.1.1	
		3, 6	TDDConf.2.1	
PDSCH RMC configuration		1, 4	SR.1.1 FDD	
		2, 5	SR.1.1 TDD	
		3, 6	SR.2.1 TDD	
RMSI CORESET RMC configuration		1, 4	CR.1.1 FDD	
		2, 5	CR.1.1 TDD	
		3, 6	CR.2.1 TDD	
Dedicated CORESET RMC configuration		1, 4	CCR.1.1 FDD	
		2, 5	CCR.1.1 TDD	
		3, 6	CCR.2.1 TDD	
SSB configuration		1, 4	SSB.1 FR1	
		2, 5	SSB.1 FR1	
		3, 6	SSB.2 FR1	
SMTC configuration		1, 4	SMTC pattern 2	
		2, 5	SMTC pattern 1	
		3, 6	SMTC pattern 1	
OCNG Pattern		1, 2, 3, 4, 5, 6	OP.1 defined in A.3.2.1	
Initial DL BWP configuration		1, 2, 3, 4, 5, 6	DLBWP.0.1	
Initial UL BWP configuration		1, 2, 3, 4, 5, 6	ULBWP.0.1	
RLM-RS		1, 2, 3, 4, 5, 6	SSB	
Qrxlevmin	dBm/SCS	1, 2, 4, 5	-140	
		3, 6	-137	
N_{oc}	dBm/SCS	1, 4	-100	-98
		2, 5	-100	-98
		3, 6	-97	-95
N_{oc}	dBm/15 kHz	1, 2, 3, 4, 5, 6	-100	-98
SS-RSRP	dBm/SCS	1, 4	-103.6	-84.4
		2, 5	-103.6	-84.4
		3, 6	-100.6	-81.4
$\hat{E}_s/I_{ot}$	dB	1, 4	-3.6	13.6
		2, 5		
		3, 6		
$\hat{E}_s/N_{oc}$	dB	1, 4	-3.6	13.6
		2, 5		
		3, 6		
Io	dBm/9.36 MHz	1, 4	-70.48	-56.26
	dBm/9.36 MHz	2, 5	-70.48	-56.26
	dBm/38.16 MHz	3, 6	-64.37	-50.16
Treselection	S	1, 2, 3, 4, 5, 6	0	
SnonintrasearchP	dB	1, 2, 3, 4, 5, 6	50	
Thresh$_{x, highP}$	dB	1, 2, 3, 4, 5, 6	48	
Thresh$_{serving, lowP}$	dB	1, 2, 3, 4, 5, 6	44	
Thresh$_{x, low P}$ (Note 2)	dB	1, 2, 3, 4, 5, 6	50	
S$_{SearchDeltaP}$	dB	1, 2, 3, 4, 5, 6	3	
T$_{SearchDeltaP}$	s	1, 2, 3, 4, 5, 6	5	
Propagation Condition		1, 2, 3, 4, 5, 6	AWGN	
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.				
Note 2: This refers to the value of Thresh$_{x, Low}$ which is included in NR system information, and is a threshold for the E-UTRA target cell				

Table 6.1.2.3.5-2: Cell specific test parameters for E-UTRA cell 2

Parameter	Unit	Cell 2	
		T1	T2 T3
E-UTRA RF Channel number		1	
BW$_{channel}$	MHz	10	
OCNG Patterns defined in TS 36.133 clause A.3.2		OP.2 TDD for test configuration 1, 2, 3; OP.2 FDD for test configuration 4, 5, 6	
PBCH_RA	dB	0	
PBCH_RB	dB		
PSS_RA	dB		
SSS_RA	dB		
PCFICH_RB	dB		
PHICH_RA	dB		
PHICH_RB	dB		
PDCCH_RA	dB		
PDCCH_RB	dB		
PDSCH_RA	dB		
PDSCH_RB	dB		
OCNG_RA$^{Note 1}$	dB		
OCNG_RB$^{Note 1}$	dB		
Qrxlevmin	dBm	-140	
N_{oc}	dBm/15 kHz	-98	
RSRP	dBm/15 KHz	-82.4	-84
$\hat{E}_s/I_{ot}$	dB	15.6	14
$\hat{E}_s/N_{oc}$	dB	15.6	14
Treselection$_{EUTRAN}$	S	0	
Snonintrasearch P	dB	Not sent	
Thresh$_{x, highP}$ (Note 2)	dB	48	
Thresh$_{serving, lowP}$	dB	44	
Thresh$_{x, lowP}$	dB	50	
Propagation Condition		AWGN	
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			
Note 2: This refers to the value of Thresh$_{x, high}$ which is included in E-UTRA system information, and is a threshold for the NR target cell			

The cell reselection delay to a lower priority E-UTRAN cell with 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 2, and starts to send preambles on the PRACH for sending the *RRCConnectionRequest* message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to a lower priority cell shall be less than 17 s.

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

NOTE: The cell re-selection delay to a lower priority cell can be expressed as: T$_{evaluate, E-UTRAN}$ + T$_{SI-E-UTRA}$,

Where:

T$_{evaluate, E-UTRAN}$ See Table 4.2.2.11.2-1 in clause 4.2.2.11.2 of TS 38.133 [6]

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

This gives a total of 16.64 s, allow 17 s for the cell re-selection delay to a lower priority E-UTRAN cell for UE fulfilling low mobility criterion.

6.1.2.4 NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRAN for UE fulfilling not-at-cell edge relaxed measurement criterion

6.1.2.4.1 Test purpose

This test is to verify the requirement for the NR to E-UTRAN inter-RAT cell reselection when UE fulfils the not-at-cell edge criterion specified in clause 4.2.2.11.3 of TS 38.133 [6] and the E-UTRAN cell is of lower priority.

6.1.2.4.2 Test applicability

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

6.1.2.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.2.4.

6.1.2.4.4 Test description

6.1.2.4.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 6.1.2.4.4.1-1.

Table 6.1.2.4.4.1-1: Supported test configurations

Configuration	Description of serving cell	Description of target cell
6.1.2.4-1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	LTE 10MHz bandwidth, TDD duplex mode
6.1.2.4-2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	LTE 10MHz bandwidth, TDD duplex mode
6.1.2.4-3	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	LTE 10MHz bandwidth, TDD duplex mode
6.1.2.4-4	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	LTE 10MHz bandwidth, FDD duplex mode
6.1.2.4-5	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	LTE 10MHz bandwidth, FDD duplex mode
6.1.2.4-6	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	LTE 10MHz bandwidth, FDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.		

Configure the test requirement and the DUT according to the parameters in Table 6.1.2.4.4.1-2.

Table 6.1.2.4.4.1-2: Initial conditions for NR SA FR1 – E-URTA cell re-selection to lower priority E-UTRA 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 6.1.2.4.4.1-1.		
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 6.1.2.4.4.1-3.

2. Message contents are defined in clause 6.1.2.4.4.3.

3. The test scenario comprises of one NR cell and one E-UTRAN cell. Cell 1 is the NR PCell and Cell 2 is the E-UTRA neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1.

Table 6.1.2.4.4.1-3: General test parameters for NR to lower priority E-UTRAN cell re-selection test case

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3, 4, 5, 6	Cell1	The UE camps on cell 1 in the initial phase and fulfil the not at the cell edge criteria.
	Neighbour cell		1, 2, 3, 4, 5, 6	Cell2	
T1 end condition	Active cell		1, 2, 3, 4, 5, 6	Cell2	The UE shall perform reselection to cell 2 during T1.
	Neighbour cell		1, 2, 3, 4, 5, 6	Cell1	
T2 end condition	Active cell		1, 2, 3, 4, 5, 6	Cell1	The UE shall perform reselection to cell 1 during T2 for iteration of the tests.
	Neighbour cell		1, 2, 3, 4, 5, 6	Cell2	
Access Barring Information		-	1, 2, 3, 4, 5, 6	Not Sent	No additional delays in random access procedure.
DRX cycle length		s	1, 2, 3, 4, 5, 6	0.64	The value shall be used for all cells in the test.
NR PRACH configuration index			1, 2, 3, 4, 5, 6	102	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
E-UTRAN PRACH configuration index			1, 2, 3	53	As specified in table 5.7.1-2 in TS 36.211
			4, 5, 6	4	
T1		s	1, 2, 3, 4, 5, 6	24	T1 needs to be defined so that cell re-selection reaction time is taken into account.
T2		s	1, 2, 3, 4, 5, 6	24	T2 needs to be defined so that cell re-selection reaction time is taken into account.

6.1.2.4.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) and an E-UTRA neighbour cell (Cell 2). The test consists of two successive time periods, with time duration of T1 and T2 respectively. Both NR cell 1 and E-UTRAN cell 2 are already identified by the UE prior to the start of the test. E-UTRAN cell 2 is of lower priority than cell 1.

The UE is configured with the relaxed measurement criterion for UE with not-at-cell edge defined in clause 5.2.4.9.2 in TS 38.304 [30]. So, Cell 1 configures the UE as follows:

- *lowMobilityEvalutation* [2] criterion is not configured;

- *cellEdgeEvaluation* [2] criterion is configured according to the parameters listed in Table 6.1.2.4.5-1;

- *combineRelaxedMeasCondition* [2] is not configured

The cell reselection delay to a lower priority E-UTRAN cell with 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 2, and starts to send preambles on the PRACH for sending the RRC CONNECTION REQUEST message to perform a Tracking Area Update procedure on cell 2.

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

2. Set the parameters according to T1 in Table 6.1.2.4.5-1 and 6.1.2.4.5-2. T1 starts.

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

4. If the UE responds on Cell 2 during time duration T1 within 17 seconds from the beginning of time period T1 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

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 11.

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

7. The SS shall switch the power setting from T1 to T2 as specified in Table 6.1.2.4.5-1 and 6.1.2.4.5-2. T2 starts.

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

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 skip to step 11.

10 The SS shall send an RRCConnectionRelease to ensure that the UE is in state RRC_IDLE, and then skip to step 12.

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

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

6.1.2.4.4.3 Message contents

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

Table 6.1.2.4.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	Table H.2.3-1

Table H.2.3-2 with Condition SMTC 1 and lower priority for configuration 6.1.2.4-2, 6.1.2.4-3, 6.1.2.4-5 and 6.1.2.4-6
Table H.2.3-2 with Condition SMTC 2 and lower priority for configuration 6.1.2.4-1 and 6.1.2.4-4

Table H.2.3-3 with Condition lower priority |
| Default RRC messages and information elements contents exceptions | Table H.3.2-1 |

Table 6.1.2.3.4.3-2: SIB2

Derivation Path: TS 38.508-1 [14] Table 4.6.2-1			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB2 ::= SEQUENCE {			
relaxedMeasurement-r16 SEQUENCE {			
lowMobilityEvaluation-r16	Not present		
cellEdgeEvaluation-r16 SEQUENCE {			
s-SearchTHresholdP-r16	32		
}			
combineRelaxedMeasCondition-r16	Not present		
highPriorityMeasRelax-r16	Not present		
}			
}			

Table 6.1.2.4.4.3-3: SystemInformationBlockType3

Derivation Path: TS 36.508 [25] Table 4.4.3.3-2			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType3 ::= SEQUENCE {			
cellReselectionServingFreqInfo SEQUENCE {			
threshServingLow	22	Actual value = 44 dB	
cellReselectionPriority	4		lower priority E-UTRA
}			
}			

Table 6.1.2.4.4.3-4: SystemInformationBlockType24

Information Element	Value/remark	Comment	Condition
Derivation Path: TS 36.508 [25] Table 4.4.3.3-20			
SystemInformationBlockType24-r15 ::= SEQUENCE {			
carrierFreqListNR-r15 SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE {	1 entry		
cellReselectionPriority-r15[*n*]	5		lower priority E-UTRA
threshX-High-r15[1]	24	Actual value = 48 dB	
threshX-Low-r15[1]	25	Actual value = 50 dB	
}			
}			

6.1.2.4.5 Test requirement

Tables 6.1.2.4.4.1-3, 6.1.2.4.5-1 and 6.1.2.4.5-2 define the primary level settings including test tolerances for lower priority E-UTRA cell re-selection test case.

Table 6.1.2.4.5-1: Cell specific test parameters for NR cell 1

Parameter	Unit	Test configuration	Cell 1	
			T1	T2
TDD configuration		1, 4	N/A	
		2, 5	TDDConf.1.1	
		3, 6	TDDConf.2.1	
PDSCH RMC configuration		1, 4	SR.1.1 FDD	
		2, 5	SR.1.1 TDD	
		3, 6	SR.2.1 TDD	
RMSI CORESET RMC configuration		1, 4	CR.1.1 FDD	
		2, 5	CR.1.1 TDD	
		3, 6	CR.2.1 TDD	
Dedicated CORESET RMC configuration		1, 4	CCR.1.1 FDD	
		2, 5	CCR.1.1 TDD	
		3, 6	CCR.2.1 TDD	
SSB configuration		1, 4	SSB.1 FR1	
		2, 5	SSB.1 FR1	
		3, 6	SSB.2 FR1	
SMTC configuration		1, 4	SMTC pattern 2	
		2, 5	SMTC pattern 1	
		3, 6	SMTC pattern 1	
OCNG Pattern		1, 2, 3, 4, 5, 6	OP.1 defined in A.3.2.1	
Initial DL BWP configuration		1, 2, 3, 4, 5, 6	DLBWP.0.1	
Initial UL BWP configuration		1, 2, 3, 4, 5, 6	ULBWP.0.1	
RLM-RS		1, 2, 3, 4, 5, 6	SSB	
Qrxlevmin	dBm/SCS	1, 2, 4, 5	-140	
		3, 6	-137	
N_{oc}	dBm/SCS	1, 4	-100	-98
		2, 5	-100	-98
		3, 6	-97	-95
N_{oc}	dBm/15 kHz	1, 2, 3, 4, 5, 6	-100	-98
SS-RSRP	dBm/SCS	1, 4	-103.6	-84.4
		2, 5	-103.6	-84.4
		3, 6	-100.6	-81.4
$\hat{E}_s / I_{ot}$	dB	1, 4	-3.6	13.6
		2, 5		
		3, 6		
$\hat{E}_s / N_{oc}$	dB	1, 4	-3.6	13.6
		2, 5		
		3, 6		
S$_{SearchThresholdP}$	dB	1, 2, 3, 4, 5, 6	32	32
Io	dBm/9.36 MHz	1, 4	-70.48	-56.26

Parameter	Unit	Test configuration	Cell 1	
			T1	**T2**
	dBm/9.36 MHz	2, 5	-70.48	-56.26
	dBm/38.16 MHz	3, 6	-64.38	-50.17
Treselection	S	1, 2, 3, 4, 5, 6	0	
SnonintrasearchP	dB	1, 2, 3, 4, 5, 6	60	
Thresh$_{x, highP}$	dB	1, 2, 3, 4, 5, 6	48	
Thresh$_{serving, lowP}$	dB	1, 2, 3, 4, 5, 6	44	
Thresh$_{x, low P}$ (Note 2)	dB	1, 2, 3, 4, 5, 6	50	
Propagation Condition		1, 2, 3, 4, 5, 6	AWGN	
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.				
Note 2: This refers to the value of Thresh$_{x, Low}$ which is included in NR system information, and is a threshold for the E-UTRA target cell				

Table 6.1.2.4.5-2: Cell specific test parameters for E-UTRA cell 2

Parameter	Unit	Cell 2	
		T1	**T2** **T3**
E-UTRA RF Channel number		1	
BW$_{channel}$	MHz	10	
OCNG Patterns defined in TS 36.133 clause A.3.2		OP.2 TDD for test configuration 1, 2, 3; OP.2 FDD for test configuration 4, 5, 6	
PBCH_RA	dB		
PBCH_RB	dB		
PSS_RA	dB		
SSS_RA	dB		
PCFICH_RB	dB		
PHICH_RA	dB		
PHICH_RB	dB	0	
PDCCH_RA	dB		
PDCCH_RB	dB		
PDSCH_RA	dB		
PDSCH_RB	dB		
OCNG_RA$^{Note 1}$	dB		
OCNG_RB$^{Note 1}$	dB		
Qrxlevmin	dBm	-140	
N_{oc}	dBm/15 kHz	-98	
RSRP	dBm/15 KHz	-82.4	-84
$\hat{E}_s / I_{ot}$	dB	15.6	14
$\hat{E}_s / N_{oc}$	dB	15.6	14
Treselection$_{EUTRAN}$	S	0	
SnonintrasearchP	dB	Not sent	
Thresh$_{x, highP}$ (Note 2)	dB	48	
Thresh$_{serving, lowP}$	dB	44	
Thresh$_{x, lowP}$	dB	50	
Propagation Condition		AWGN	
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			
Note 2: This refers to the value of Thresh$_{x, high}$ which is included in E-UTRA system information, and is a threshold for the NR target cell			

The cell reselection delay to a lower priority E-UTRAN cell with 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 2, and starts to send preambles on the PRACH for sending the *RRCConnectionRequest* message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to a lower priority cell shall be less than 17 s.

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

NOTE: The cell re-selection delay to a lower priority cell can be expressed as: $T_{evaluate, \text{E-UTRAN}} + T_{\text{SI-E-UTRA}}$,

Where:

$T_{evaluate, \text{E-UTRAN}}$ See Table 4.2.2.11.3-1 in clause 4.2.2.11.3 of TS 38.133 [6]

$T_{\text{SI-E-UTRA}}$ Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280 ms is assumed in this test case.

This gives a total of 16.64 s, allow 17 s for the cell re-selection delay to a lower priority E-UTRAN cell for UE fulfilling not-at-cell edge criterion.

6.1.2.5 NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRA for UE configured with highSpeedMeasFlag-r16

6.1.2.5.1 Test purpose

This test is to verify the requirement for the NR to E-UTRAN inter-RAT cell reselection requirements specified in TS 38.133 [6] clause 4.2.2.5 when the E-UTRAN cell is of lower priority.

6.1.2.5.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards and supporting measurement enhancements in high speed scenario.

6.1.2.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.1.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.1.2.5.

6.1.2.5.4 Test description

6.1.2.5.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 6.1.2.5.4.1-1.

Table 6.1.2.5.4.1-1: Supported test configurations for NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRA for UE configured with highSpeedMeasFlag-r16

Configuration	Description of serving cell	Description of target cell
6.1.2.5-1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	LTE 10 MHz bandwidth, TDD duplex mode
6.1.2.5-2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	LTE 10 MHz bandwidth, TDD duplex mode
6.1.2.5-3	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode	LTE 10 MHz bandwidth, TDD duplex mode
6.1.2.5-4	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode	LTE 10 MHz bandwidth, FDD duplex mode
6.1.2.5-5	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	LTE 10 MHz bandwidth, FDD duplex mode
6.1.2.5-6	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode	LTE 10 MHz bandwidth, FDD 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 6.1.2.5.4.1-2.

Table 6.1.2.5.4.1-2: Initial conditions for NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRA for UE configured with highSpeedMeasFlag-r16

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.4-2 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.1.2.5.4.1-1.		
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 6.1.2.5.4.1-3.

2. Message contents are defined in clause 6.1.2.5.4.3.

3. The test scenario comprises of one NR cell and one E-UTRAN cell. Cell 1 is the NR PCell and Cell 2 is the E-UTRA neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1.

Table 6.1.2.5.4.1-3: General test parameters for NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRA for UE configured with highSpeedMeasFlag-r16

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3, 4, 5, 6	Cell1	The UE camps on cell 1 in the initial phase.
T1 end condition	Active cell		1, 2, 3, 4, 5, 6	Cell2	The UE shall perform reselection to cell 2 during T1.
	Neighbour cells		1, 2, 3, 4, 5, 6	Cell1	
T2 end condition	Active cell		1, 2, 3, 4, 5, 6	Cell1	The UE shall perform reselection to cell 1 during T2 for iteration of the tests.
	Neighbour cells		1, 2, 3, 4, 5, 6	Cell2	
Access Barring Information		-	1, 2, 3, 4, 5, 6	Not Sent	No additional delays in random access procedure.
DRX cycle length		s	1, 2, 3, 4, 5, 6	320ms	The value shall be used for all cells in the test.
NR PRACH configuration index			1, 2, 3, 4, 5, 6	77	The detailed configuration is specified in TS 38.211 clause 6.3.3.2
E-UTRAN PRACH configuration index			1, 2, 3	53	As specified in table 5.7.1-2 in TS 36.211 [23]
			4, 5, 6	4	
T1		s	1, 2, 3, 4, 5, 6	15	T1 needs to be defined so that cell re-selection reaction time is taken into account.
T2		s	1, 2, 3, 4, 5, 6	75	T2 needs to be defined so that cell re-selection reaction time is taken into account.

6.1.2.5.4.2 Test procedure

Two cells are deployed in the test, which are one FR1 NR PCell (Cell 1) and an E-UTRA low priority neighbour cell (Cell 2) on different frequencies. The test consists of 2 successive time periods, with time duration of T1, and 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. Furthermore, UE has not registered with network for the tracking area containing Cell 2. The E-UTRAN Cell 2 is indicated by NR Cell 1 as an HST cell.

In the following test procedure "UE responds" means "UE starts transmitting preamble on PRACH for sending the *RRCSetupRequest* or *RRCConnectionRequest* message to perform a Registration procedure for mobility on NR Cell or E-UTRA Cell respectively.

1. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* with 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. *highSpeedMeasFlag-r16* is provided by *SIB1* of Cell 1.

2. Set the parameters according to T2 in Table 6.1.2.5.5-1 and 6.1.2.5.5-1. Then wait 5s to ensure that Cell 2 has been detected by the UE.

3. Set the parameters according to T1 in Table 6.1.2.5.5-1 and 6.1.2.5.5-1. T1 starts.

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

5. If the UE responds on Cell 2 within 3 seconds from the beginning of time period T1, then count a success for the event "Re-select Cell 2". Otherwise count a failure for the event "Re-select Cell 2".

6. If the UE has re-selected Cell 2 within T1, after the re-selection or when T1 expires, continue with step 7. Otherwise, if T1 expires and the UE has not yet re-selected Cell 2, the TE shall switch off and on the UE and skip to step 13.

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

8. The SS shall switch the power setting from T1 to T2 as specified in Table 6.1.2.5.5-1 and 6.1.2.5.5-1. T2 starts.

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

10. If the UE has re-selected Cell 1 within T2, after the re-selection or when T2 expires, continue with step 11. Otherwise, if T2 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.

11. The SS shall send an *RRCRelease* message to ensure that the UE is in state RRC_IDLE on Cell 1. skip to 13

12. Ensure the UE is in state RRC_IDLE with generic procedure parameters connectivity *NR* according to TS 38.508-1 [14] clause 4.5 in Cell 1.

13. Set the parameters according to T2 in Table 6.1.2.5.5-1. Then wait 5s to ensure that Cell 2 has been detected by the UE.

14. Repeat step 3-13 until a test verdict for the event "Re-select Cell 2" has been achieved, resulting in an event verdict: pass or fail. The event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved. The test passes if the event pass, otherwise the test fails.

6.1.2.5.4.3   Message contents

Same as message contents in 6.1.2.2.4.3 except that

- Table H.2.3-1 in common contents of SIB exceptions is replaced by Table 6.1.2.5.4.3-1.

- Table H.2.3-3 in common contents of SIB exceptions is replaced by Table 6.1.2.5.4.3-3.

- In addition to the message contents mentioned above, exceptions given in Table 6.1.2.5.4.3-4 and Table 6.1.2.5.4.3-5 also apply.

Table 6.1.2.5.4.3-1: SIB1 (Cell 2)

Derivation Path: TS 38.508-1 [14], Table 4.6.1-28			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB1 ::= SEQUENCE {			
servingCellConfigCommon	ServingCellConfigCommonSIB	Table 6.1.2.5.4.3-2	
}			

Table 6.1.2.5.4.3-2: ServingCellConfigCommonSIB (Table 6.1.2.5.4.3-1)

Derivation Path: TS 38.508-1 [14], Table 4.6.1-28 with condition HST			
Information Element	**Value/remark**	**Comment**	**Condition**
ServingCellConfigCommonSIB ::= SEQUENCE {			
highSpeedConfig-r16 SEQUENCE {			
highSpeedMeasFlag-r16	true		
}			
}			

Table 6.1.2.5.4.3-3: SIB5 (Cell 1)

Derivation Path: Table H.2.3-3 with Condition lower priority			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB5 ::= SEQUENCE {			
carrierFreqListEUTRA-v1610 SEQUENCE (SIZE (1..maxEUTRA-Carrier)) OF CarrierFreqEUTRA-v1610 {	1 entry	carrierFreqListEUTRA-v1610 and carrierFreqListEUTRA contain same number of entries. And the entries are listed in the same order	
CarrierFreqEUTRA-v1610[1] SEQUENCE {		entry 1	
highSpeedEUTRACarrier-r16	true		
}			
}			
}			

Table 6.1.2.5.4.3-4: SystemInformationBlockType2 (Cell2)

Derivation Path: TS 36.508 [25] Table 4.4.3.3-1			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType2 ::= SEQUENCE {			
radioResourceConfigCommon SEQUENCE {			
highSpeedInterRAT-NR-r16	true		
}			
}			

Table 6.1.2.5.4.3-5: SystemInformationBlockType24 (Cell2)

Derivation Path: TS 36.508 [25], Table 4.4.3.3-20			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType24-r15 ::= SEQUENCE {			
carrierFreqListNR-v1610 SEQUENCE (SIZE (1..maxFreq)) OF CarrierFreqNR-v1610 {	1 entry		
CarrierFreqNR-v1610[1] SEQUENCE {		entry 1	
highSpeedCarrierNR-r16	true		
}			
}			
}			

6.1.2.5.5 Test requirement

Tables 6.1.2.5.4.1-3, 6.1.2.5.5-1 and 6.1.2.5.5-2 define the primary level settings including test tolerances for NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRA for UE configured with highSpeedMeasFlag-r16 test case.

Table 6.1.2.5.5-1: NR cell specific test parameters for NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRA for UE configured with highSpeedMeasFlag-r16

Parameter	Unit	Test configuration	Cell 1	
			T1	**T2**
TDD configuration		1, 4	N/A	
		2, 5	TDDConf.1.1	

Parameter	Unit	Test configuration	Cell 1	
			T1	T2
		3, 6	TDDConf.2.1	
PDSCH RMC configuration		1, 4	SR.1.1 FDD	
		2, 5	SR.1.1 TDD	
		3, 6	SR.2.1 TDD	
RMSI CORESET RMC configuration		1, 4	CR.1.1 FDD	
		2, 5	CR.1.1 TDD	
		3, 6	CR.2.1 TDD	
Dedicated CORESET RMC configuration		1, 4	CCR.1.1 FDD	
		2, 5	CCR.1.1 TDD	
		3, 6	CCR.2.1 TDD	
SSB configuration		1, 4	SSB.1 FR1	
		2, 5	SSB.1 FR1	
		3, 6	SSB.2 FR1	
SMTC configuration		1, 4	SMTC pattern 2	
		2, 5	SMTC pattern 1	
		3, 6	SMTC pattern 1	
OCNG Pattern		1, 2, 3, 4, 5, 6	OP.1 defined in A. 2.1	
Initial DL BWP configuration		1, 2, 3, 4, 5, 6	DLBWP.0	
Initial UL BWP configuration		1, 2, 3, 4, 5, 6	ULBWP.0	
RLM-RS		1, 2, 3, 4, 5, 6	SSB	
Qrxlevmin	dBm/SCS	1, 2, 4, 5	-140	
		3, 6	-137	
N_{oc}	dBm/SCS	1, 4	-100	-98
		2, 5	-100	-98
		3, 6	-97	-95
N_{oc}	dBm/15 kHz	1, 2, 3, 4, 5, 6	-100	-98
SS-RSRP	dBm/SCS	1, 4	-103.60	-84.40
		2, 5	-103.60	-84.40
		3, 6	-100.60	-81.40
$\hat{E}_s/I_{ot}$	dB	1, 4	-3.6	13.6
		2, 5		
		3, 6		
$\hat{E}_s/N_{oc}$	dB	1, 4	-3.6	13.6
		2, 5		
		3, 6		
Io	dBm/9.36 MHz	1, 4	-70.46	-56.26
	dBm/9.36 MHz	2, 5	-70.46	-56.26
	dBm/38.16 MHz	3, 6	-64.38	-50.16
Treselection	S	1, 2, 3, 4, 5, 6	0	
Snonintrasearch	dB	1, 2, 3, 4, 5, 6	50	
Thresh$_{x, high}$ (Note 2)	dB	1, 2, 3, 4, 5, 6	48	
Thresh$_{serving, low}$	dB	1, 2, 3, 4, 5, 6	44	
Thresh$_{x, low}$	dB	1, 2, 3, 4, 5, 6	50	
Propagation Condition		1, 2, 3, 4, 5, 6	AWGN 1944Hz[Note3]	
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.				
Note 2: This refers to the value of Thresh$_{x, high}$ which is included in NR system information, and is a threshold for the E-UTRA target cell.				
Note 3: The AWGN 1944 Hz condition is a non-fading propagation channel with one tap. Doppler shift is a constant 1944 Hz.				

Table 6.1.2.5.5-2: E-UTRA cell specific test parameters for NR SA FR1 – E-UTRA cell re-selection to lower priority E-UTRA for UE configured with highSpeedMeasFlag-r16

Parameter	Unit	Cell 2	
		T1	T2
E-UTRA RF Channel number		1	
BW$_{channel}$	MHz	10	
OCNG Patterns defined in TS 36.133 [15] clause A.3.2		OP.2 TDD for test configuration 1, 2, 3; OP.2 FDD for test configuration 4, 5, 6	
PBCH_RA	dB	0	
PBCH_RB	dB		
PSS_RA	dB		
SSS_RA	dB		
PCFICH_RB	dB		
PHICH_RA	dB		
PHICH_RB	dB		
PDCCH_RA	dB		
PDCCH_RB	dB		
PDSCH_RA	dB		
PDSCH_RB	dB		
OCNG_RA$^{Note\ 1}$	dB		
OCNG_RB$^{Note\ 1}$	dB		
Qrxlevmin	dBm	-140	
N_{oc}	dBm/15 kHz	-98	
RSRP	dBm/15 KHz	-82.40	-84
$\hat{E}_s/I_{ot}$	dB	15.60	14
$\hat{E}_s/N_{oc}$	dB	15.60	14
Treselection$_{EUTRAN}$	S	0	
Snonintrasearch	dB	Not sent	
Thresh$_{x,\ high}$ (Note 2)	dB	48	
Thresh$_{serving,\ low}$	dB	44	
Thresh$_{x,\ low}$	dB	50	
Propagation Condition		AWGN 1944Hz	
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.			
Note 2: This refers to the value of Thresh$_{x,\ high}$ which is included in E-UTRA system information, and is a threshold for the NR target cell			

The cell reselection delay to a lower priority E-UTRAN cell for UE configured with *highSpeedMeasFlag-r16* 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 *RRCConnectionRequest* message to perform a Tracking Area Update procedure on cell 2.

The cell re-selection delay to a lower priority cell shall be less than 3 s.

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

NOTE: The cell re-selection delay to a lower priority cell can be expressed as: T$_{evaluate,\ E-UTRAN}$ + T$_{SI-E-UTRA}$,

Where:

T$_{evaluate,\ E-UTRAN}$ = 0.96s, as defined in TS 38.133 [6] Table 4.2.2.5-2.

T$_{SI-E-UTRA}$ = 1.28s, is the maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell.

This gives a total of 2.24 s, allow 3 s for the cell re-selection delay to a lower priority E-UTRAN cell for UE configured with *highSpeedMeasFlag-r16*.

6.2 RRC_INACTIVE state mobility

6.3 RRC_CONNECTED state mobility

6.3.1 Handover

6.3.1.0 Minimum conformance requirements

6.3.1.0.1 Minimum conformance requirements for NR – E-UTRAN handover

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

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

Where:

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

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

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

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

Where:

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

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

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

In the interruption requirement a cell is know if it has been meeting the relevant cell identification requirement during the last 5 seconds otherwise it is unknown. Relevant cell identification requirements are described in TS 36.133 [6] clause [9.4.1].

The normative reference for this requirement is TS 38.133 [6] clause 6.1.2.1.

6.3.1.0.2 Minimum conformance requirements for NR FR1 – NR FR1 handover

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

Where:

$D_{handover}$ equals the maximum RRC procedure delay to be defined in clause12 in TS 38.331 [2] plus the interruption time stated in clause 6.1.1.2.2.

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

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

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

Where:

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

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

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

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

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

In the interruption requirement a cell is known if it has been meeting the relevant cell identification requirement during the last 5 seconds otherwise it is unknown. Relevant cell identification requirements are described in Clause [9.2.5] for intra-frequency handover and Clause [9.3.1] for inter-frequency handover.

The normative reference for this requirement is TS 38.133 [6] clause 6.1.1.2.

6.3.1.0.3 Minimum conformance requirements for NR – UTRAN handover

When the UE receives a RRC message implying handover to UTRAN the UE shall be ready to start the transmission of the new UTRA uplink DPCCH within Dhandover msfrom the end of the last NR TTI containing the RRC MobilityfromNRCommand command.

where:

- Dhandover equals the RRC procedure delay, which is 50 ms plus the interruption time stated in TS 38.133 [6] clause 6.1.2.2.3.

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

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

If the target cell is known the interruption time shall be less than Tinterrupt1

Tinterrupt1 = TIU+Tsync+50+ 10*Fmax + TMC ms

If the target cell is unknown the interruption time shall be less than Tinterrupt2

Tinterrupt2 = TIU+Tsync+150 + 10*Fmax + TMC ms

This requirement shall be met, provided that there is one target cell in the MobilityfromNRCommand command. Performance requirements for E-UTRA to UTRA soft handover are not specified. When UE is connected to an NR cell, UTRA SFN timing measurements are not reported. This implies that the timing of the DPCH of the UTRA target cells in the active set cannot be configured by UTRAN to guarantee that all target cells fall within the UE reception window of T0 +/- 148 chips.

Where:

- TIU is the interruption uncertainty when changing the timing from the NR to the new UTRAN cell. TIU can be up to one UTRA frame (10 ms).

- Fmax denotes the maximum number of radio frames within the transmission time intervals of all transport channels that are multiplexed into the same CCTrCH on the UTRA target cell. If HS-PDSCH is configured in the UTRA target cell, Fmax is 4 radio frames.

- Tsync is the time required for measuring the downlink DPCCH channel as stated in TS 25.214, clause 4.3.1.2. In case higher layers indicate the usage of a post-verification period Tsync=0 ms. Otherwise Tsync=40 ms.

- TMC is 0ms if a single UTRA cell is configured as the handover target, otherwise 20ms if handover to UTRA with 1, 2 or 3 UTRA carriers with secondary HS-PDSCH is configured.

The phase reference is the primary CPICH.

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

6.3.1.0.4 Minimum conformance requirements for NR FR1- NR FR1 DAPS handover

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

Note 1: For intra-frequency DAPS handover, no requirement applies if active DL and UL BWP of target cell is not confined within the active DL and UL BWP of the source cell respectively.

Note 2: For inter-frequency DAPS handover, no requirement applies if the BWP of target cell is overlapped with the BWP of source cell in frequency domain.

An FR1 DAPS handover is synchronous if it meets the conditions in table 6.3.1.0.4-1, otherwise it is asynchronous

Table 6.3.1.0.4-1: Sync conditions for FR1 DAPS handover

Type of handover	Maximum receive timing difference between source and target cell (µs) for sync DAPS handover	Maximum transmit timing difference between source and target cell (µs) for sync DAPS handover
Intra-frequency[Note 1,2,3]	6µs	7.6 µs
Intra-band inter-frequency [Note 1,2,3]	6µs	7.6 µs
Inter-band inter-frequency	33 µs	34.6 µs
Note 1: For synchronous DAPS handover, if the receive time difference exceeds the cyclic prefix length of that SCS, demodulation performance degradation is expected for the first symbol of the slot. For asynchronous DAPS handover, if the receive time difference exceeds the cyclic prefix length of that SCS, interruptions may occur depending on UE implementation. The duration and frequency of occurrence of such interruptions is not specified. Note 2: For DAPS handover on a TDD band, a UE is not expected to transmit in the uplink earlier than N_{RX-TX} after the end of the last received downlink symbol in the same cell where N_{RX-TX}=25600Tc. Note 3: For DAPS handover on a TDD band, a UE is not expected to receive in the downlink earlier than N_{TX-RX} after the end of the last transmitted uplink symbol in the same cell where N_{TX-RX}=25600Tc.		

When the UE receives a RRC message implying DAPS handover to NR FR1 the UE shall be ready to start the transmission of the new uplink PRACH channel in NR within $D_{handover1}$ seconds from the end of the last TTI containing the RRC command when UE is configured with dual active protocol stack handover.

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

Where:

$T_{RRC\_procedure}$ is the maximum RRC procedure delay as specified in clause 12 in TS 38.331 [13].

T_{search}, T_{IU}, $T_{processing}$, T_{Δ} and T_{margin} are defined in TS 38.133 [6] clause 6.1.1.2.2.

After successful RACH procedure of the target cell, when the UE receives an RRC message implying source cell release command, the UE shall accomplish the release actions specified in TS 38.331 [13] within $D_{handover2}$.

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

Where:

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

$T_{interrupt2}$ is defined in TS 38.133 [6] clause 6.3.1.0.4.

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

For FR1-to-FR1 intra-frequency handover, $T_{interrupt1}$ is specified in Table 6.3.1.0.4-2.

Table 6.3.1.0.4-2: $T_{interrupt1}$ for FR1-to-FR1 intra-frequency DAPS HO

μ	NR Slot length (ms)	Interruption length $T_{interrupt1}$ (slots[Note 1]), synchronous DAPS HO	Interruption length $T_{interrupt1}$ (slots[Note 1]), asynchronous DAPS HO
0	1	1	2
1	0.5	2	3
2	0.25	4	5
Note 1:	The same SCS of source cell and target cell is assumed.		
Note 2:	It is assumed that the BWP of target cell is not larger than the BWP of source cell. It is assumed that the CBW of target cell is not larger than the CBW of source cell		
Note 3:	Void		

For FR1-to-FR1 intra-band inter-frequency handover, $T_{interrupt1}$ is specified in Table 6.3.1.0.4-3.

Table 6.3.1.0.4-3: $T_{interrupt1}$ for FR1-to-FR1 intra-band inter-frequency DAPS HO

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

For FR1-to-FR1 inter-band handover, $T_{interrupt1}$ is specified in Table 6.3.1.0.4-4.

Table 6.3.1.0.4-4: $T_{interrupt1}$ for FR1-to-FR1 inter-band DAPS HO

μ	NR Slot length (ms) of source cell	$T_{interrupt1}$ (slots)	
		Sync	Async
0	1	1	2
1	0.5	2	3
2	0.25	5	5

For FR1-to-FR1 intra-frequency handover, $T_{interrupt2}$ is specified in Table 6.3.1.0.4-5 when the BWP of target cell is smaller than the BWP of source cell, and $T_{interrupt2}$ is specified in Table 6.3.1.0.4-6 when the same BWP is used for target cell and source cell.

Table 6.3.1.0.4-5: T$_{interrupt2}$ for FR1-to-FR1 intra-frequency DAPS HO

μ	NR Slot length (ms)	Interruption length X (slots[Note 1])	T$_{interrupt2}$ (slots[Note 1]) for asynchronous DAPS HO
0	1	2	3
1	0.5	4	5
2	0.25	8	9
Note 1:	The same SCS of source cell and target cell is assumed.		
Note 2:	It is assumed that the BWP of target cell is smaller than the BWP of source cell.		

Table 6.3.1.0.4-6: T$_{interrupt2}$ for FR1-to-FR1 intra-frequency DAPS HO

μ	NR Slot length (ms)	Interruption length X (slots[Note 1])	T$_{interrupt2}$ (slots[Note 1]) for asynchronous DAPS HO
0	1	1	2
1	0.5	2	3
2	0.25	4	5
Note 1:	The same SCS of source cell and target cell is assumed.		
Note 2:	It is assumed that the BWP of target cell is the same as the BWP of source cell.		
Note 3:	Void		

For FR1-to-FR1 intra-band inter-frequency handover, T$_{interrupt2}$ is specified in Table 6.3.1.0.4-7.

Table 6.3.1.0.4-7: T$_{interrupt2}$ for FR1-to-FR1 intra-band inter-frequency DAPS HO

μ	NR Slot length (ms)	T$_{interrupt2}$ (slots[Note 1]) for synchronous DAPS HO	T$_{interrupt2}$ (slots[Note 1]) for asynchronous DAPS HO
0	1	$1 + T_{SMTC\_duration} * N_{slot}^{subframe,\mu}$	$2 + T_{SMTC\_duration} * N_{slot}^{subframe,\mu}$
1	0.5	$2 + T_{SMTC\_duration} * N_{slot}^{subframe,\mu}$	$3 + T_{SMTC\_duration} * N_{slot}^{subframe,\mu}$
2	0.25	$4 + T_{SMTC\_duration} * N_{slot}^{subframe,\mu}$	$5 + T_{SMTC\_duration} * N_{slot}^{subframe,\mu}$
Note 1:	The same SCS of source cell and target cell is assumed.		
Note 2:	T$_{SMTC\_duration}$ measured in subframes is the longest SMTC duration between source cell and target cell.		
Note 3:	Void.		
Note 4:	$N_{slot}^{subframe,\mu}$ is as defined in TS 38.211 [6].		

For FR1-to-FR1 inter-band handover, T$_{interrupt2}$ is specified in Table 6.3.1.0.4-8.

Table 6.3.1.0.4-8: T$_{interrupt2}$ for FR1-to-FR1 inter-band DAPS HO

μ	NR slot length (ms) of target cell	T$_{interrupt2}$ (slots)	
		Sync	Async
0	1	1	2
1	0.5	2	3
2	0.25	5	5

The normative reference for this requirement is TS 38.133 [6] clause 6.1.1.2.

6.3.1.1 NR SA FR1 handover with known target cell

6.3.1.1.1 Test purpose

To verify the UE's ability to perform NR FR1-NR FR1 intra frequency handover in RRC_CONNECTED state by meeting the delay requirement and interruption length for handover to a known target cell.

6.3.1.1.2 Test applicability

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

6.3.1.1.3   Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.1.

6.3.1.1.4   Test description

6.3.1.1.4.1   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.

This test shall be tested using any of the test configurations in Table 6.3.1.1.4.1-1.

Table 6.3.1.1.4.1-1: Intra-frequency handover from FR1 to FR1 test configurations

Config	Description
1	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
	Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
	Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3	Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
	Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note:	The UE is only required to be tested in one of the supported test configurations

Configure the test equipment and the DUT according to the parameters in Table 6.3.1.1.4.1-2

Table 6.3.1.1.4.1-2: Initial conditions for NR SA FR1 handover with known target cell

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.3.1.1.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 6.3.1.1.4.3.

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 FR1 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 6.3.1.1.4.1-3 below, with A3-Offset modified by Test Tolerance.

Table 6.3.1.1.4.1-3: General test parameters Intra-frequency handover from FR1 to FR1

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
A3-Offset		dB	-1	Original Value 0dB, post TT Analysis, its -1 dB
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	≤5	

| T3 | s | 1 | |

6.3.1.1.4.2 Test procedure

The test scenario comprises of one NR carrier and two cells as given in tables 6.3.1.1.4.1-3 and 6.3.1.1.5-1. No gap patterns are configured in the test case. The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable and the UE is expected to detect and send measurement report A3. An RRC message implying handover shall be sent to the UE during period T2, after the UE has reported Event A3. The start of T3 is the instant when the last TTI containing the RRC message implying handover is sent to 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. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 6.3.1.1.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. SS shall transmit an RRCReconfiguration message, configuring measurement object.

4. UE shall transmit RRCReconfigurationComplete message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.3.1.15-1.

6. UE shall transmit a MeasurementReport message triggered by Event A3.

7. SS shall transmit the RRCReconfiguration message implying handover is sent to the UE, at that instant the SS shall switch the power settings from T2 to T3 as specified in Table 6.3.1.1.5-1. T3 starts.

8. The UE shall transmit RRCReconfigurationComplete message.

9. If the UE transmits the uplink PRACH channel to Cell 2 less than 72 ms from the beginning of time period T3 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

10. 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.

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

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

6.3.1.1.4.3 Message contents

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

Table 6.3.1.1.4.3-1: 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 with Condition INTRA-FREQ and no GAP NEEDED Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1, SMTC pattern 1 and Synchronous cells for Config 1 and 2 Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.2 FR1, SMTC pattern 1 and Synchronous cells for Config 3 Table H.3.1-4 with A3-offset = -1dB Table H.3.1-5 Table H.3.1-7 with Condition INTRA-FREQ Table H.3.2-2 with Condition RBConfig_KeyChange

6.3.1.1.5 Test requirements

Table 6.3.1.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 6.3.1.1.5-1: Cell specific test parameters for NR FR1-FR1 Intra frequency handover test case

Parameter		Unit	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
NR RF Channel Number			1			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					
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					
TRS configuration	Config 1		TRS.1.1 FDD					
	Config 2		TRS.1.1 TDD					
	Config 3		TRS.1.2 TDD					
OCNG Patterns			OP.1					
SMTC Configuration			SMTC.1					
SSB Configuration	Config 1,2		SSB.1 FR1					
	Config 3		SSB.2 FR1					
PDSCH/PDCCH subcarrier spacing	Config 1,2	kHz	15 kHz					
	Config 3		30 kHz					
PUCCH/PUSCH subcarrier spacing	Config 1,2	kHz	15 kHz					
	Config 3		30 kHz					
PRACH configuration			PRACH.1 FR1					
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					
EPRE ratio of PBCH DMRS to SSS								
EPRE ratio of PBCH to PBCH DMRS								
EPRE ratio of PDCCH DMRS to SSS								
EPRE ratio of PDCCH to PDCCH DMRS								
EPRE ratio of PDSCH DMRS to SSS								
EPRE ratio of PDSCH to PDSCH								
EPRE ratio of OCNG DMRS to SSS(Note 1)								
EPRE ratio of OCNG to OCNG DMRS (Note 1)								
N_{oc} Note2		dBm/15kHz	-98			-98		
N_{oc} Note2	Config 1,2	dBm/SCS	-98			-98		
	Config 3		-95			-95		
$\hat{E}_s/I_{ot}$	Config 1,2	dB	8	-2.41	-2.41	-Infinity	1.36	1.36
	Config 3	dB	8	-2.41	-2.41	-Infinity	1.36	1.36
$\hat{E}_s/N_{oc}$	Config 1,2	dB	8	8	8	-Infinity	10	10
	Config 3	dB	8	8	8	-Infinity	10	10
SSB_RP	Config 1,2	dBm/SCS	-90	-90	-90	Infinity	-88	-88
	Config 3	dBm/SCS	-87	-87	-87	Infinity	-84.99	-84.99
Io Note3	Config 1,2	dBm/ 9.36MHz	-61.41	-57.67	-57.67	-61.41	-57.67	-57.67
	Config 3	dBm/	-55.31	-51.56	-51.56	-55.31	-51.56	-51.56

Parameter		Unit	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
		38.16MHz						
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.							

The UE shall start to transmit the PRACH to Cell 2 less than 72 ms from the beginning of time period T3.
The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay + $T_{interrupt}$, where:

RRC procedure delay = 10 ms and is specified in clause 12 in TS 38.331 [2].

$T_{interrupt}$ = 62 ms in the test. $T_{interrupt}$ is defined in clause 6.3.1.0.2.

This gives a total of 72 ms.

6.3.1.2 NR SA FR1 handover with unknown target cell

6.3.1.2.1 Test purpose

To verify the UE's ability to perform NR FR1-NR FR1 intra frequency handover in RRC_CONNECTED state by meeting the delay requirement and interruption length for handover to an unknown target cell.

6.3.1.2.2 Test applicability

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

6.3.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.2.

6.3.1.2.4 Test description

6.3.1.2.4.1 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.

This test shall be tested using any of the test configurations in Table 6.3.1.2.4.1-1.

Table 6.3.1.2.4.1-1: Intra-frequency handover from FR1 to FR1 test configurations

Config	Description
1	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3	Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note:	The UE is only required to be tested in one of the supported test configurations

Configure the test equipment and the DUT according to the parameters in Table 6.3.1.2.4.1-2

Table 6.3.1.2.4.1-2: Initial conditions for NR SA FR1 handover with unknown target cell

Parameter		Value	Comment
Test environment		NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies		As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.	
Channel bandwidth		As specified by the test configuration selected from Table 6.3.1.2.4.1-1	
Propagation conditions		AWGN	As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram		N/A	

1. Message contents are defined in clause 6.3.1.2.4.3.

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 FR1 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 6.3.1.2.4.1-4 below.

Table 6.3.1.2.4.1-3: General test parameters Intra-frequency handover from FR1 to FR1

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
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	≤5	

6.3.1.2.4.2 Test procedure

The test scenario comprises of two NR carriers and one cell on each carrier as given in tables 6.3.1.2.4.1-3 and 6.3.1.2.5-1. No gap patterns are 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 does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable and the UE is expected to detect and start to transmit the PRACH to Cell 2. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to 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. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 6.3.1.2.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. SS shall transmit an RRCReconfiguration message implying handover to Cell 2.

4. The start of T2 is the instant when the last TTI containing the RRC reconfiguration message implying handover is sent to the UE, at that instant the SS shall switch the power settings from T1 to T2 as specified in Table 6.3.1.2.5-1. T2 starts.

5. The UE shall transmit RRCReconfigurationComplete message.

6. If the UE transmits the uplink PRACH channel to Cell 2 less than 92 ms from the beginning of time period T2 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

7. After T2 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.

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

9. Repeat step 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.3.1.2.4.3 Message contents

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

Table 6.3.1.2.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.2-2 with Condition RBConfig_KeyChange

6.3.1.2.5 Test requirements

Table 6.3.1.2.5-1 defines the primary level settings including test tolerances for all tests.

Table 6.3.1.2.5-1: Cell specific test parameters for NR FR1-FR1 Intra frequency handover test case

Parameter		Unit	Cell 1		Cell 2	
			T1	T2	T1	T2
NR RF Channel Number			1		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			
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			
TRS configuration	Config 1		TRS.1.1 FDD			
	Config 2		TRS.1.1 TDD			
	Config 3		TRS.1.2 TDD			
OCNG Patterns			OP.1			
SMTC Configuration			SMTC.1 FR1			
SSB configuration	Config 1,2		SSB.1 FR1			
	Config 3		SSB.2 FR1			
PDSCH/PDCCH subcarrier spacing	Config 1,2	kHz	15 kHz			
	Config 3		30 kHz			
PUCCH/PUSCH subcarrier spacing	Config 1,2	kHz	15 kHz			
	Config 3		30 kHz			
PRACH configuration			PRACH.1 FR1			
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			
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						

Parameter		Unit	Cell 1		Cell 2	
			T1	T2	T1	T2
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
N_{oc} Note2		dBm/15kHz	-98		-98	
N_{oc} Note2	Config 1,2	dBm/SCS	-98		-98	
	Config 3		-95		-95	
$\hat{E}_s/I_{ot}$		dB	8	-0.64	-Infinity	-0.64
$\hat{E}_s/N_{oc}$		dB	8	8	-Infinity	8
SSB_RP	Config 1,2	dBm/SCS	-90	-90	-Infinity	-90
	Config 3	dBm/SCS	-87	-87	-Infinity	-87
Io Note3	Config 1,2	dBm/ 9.36MHz	-61.41	-57.95	-61.41	-57.95
	Config 3	dBm/ 38.16MHz	-55.31	-51.84	-55.31	-51.84
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.						

The UE shall start to transmit the PRACH to Cell 2 less than 92 ms from the beginning of time period T2.
The rate of correct handovers observed during repeated tests shall be at least 90%.

NOTE: The handover delay can be expressed as: RRC procedure delay + $T_{interrupt}$, where:

RRC procedure delay = 10 ms and is specified in clause 12 in TS 38.331 [2].

$T_{interrupt}$ = 82 ms in the test. $T_{interrupt}$ is defined in clause 6.3.1.0.2.

This gives a total of 92 ms.

6.3.1.3 NR SA FR1-FR1 handover with unknown target cell

6.3.1.3.1 Test purpose

To verify the UE's ability to perform NR FR1-NR FR1 inter frequency handover in RRC_CONNECTED state by meeting the delay requirement and interruption length for handover to an unknown target cell.

6.3.1.3.2 Test applicability

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

6.3.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.3.

6.3.1.3.4 Test description

6.3.1.3.4.1 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.

This test shall be tested using any of the test configurations in Table 6.3.1.3.4-1.

Table 6.3.1.3.4.1-1: Inter-frequency handover from FR1 to FR1 test configurations

Config	Description
1	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
	Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
2	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
	Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
3	Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
	Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note:	The UE is only required to be tested in one of the supported test configurations

Configure the test equipment and the DUT according to the parameters in Table 6.3.1.3.4-2

Table 6.3.1.3.4.1-2: Initial conditions for NR SA FR1 handover with unknown target cell

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.3.1.3.4-3		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 6.3.1.3.4.3.

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 FR1 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 Tables 6.3.1.3.4.1-3 and 6.3.1.3.5-1 below.

Table 6.3.1.3.4.1-3: General test parameters Inter-frequency handover from FR1 to FR1

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
Access Barring Information		-	Not Sent	No additional delays in random access procedure.
T1		s	5	
T2		s	≤5	

6.3.1.3.4.2 Test procedure

The test scenario comprises of two NR carriers and one cell on each carrier as given in tables 6.3.1.3.4-3 and 6.3.1.3.5-1. No gap patterns are 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 does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable and the UE is expected to detect and start to transmit the PRACH to Cell 2.

1. Ensure the UE is in State 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.

2. Set the parameters according to T1 in Table 6.3.1.3.5-1. Propagation conditions are set according to Annex C clause C.2.2. T1 starts.

3. SS shall transmit an RRCReconfiguration message implying handover to Cell 2.

4. The start of T2 is the instant when the last TTI containing the RRC reconfiguration message implying handover is sent to the UE, at that instant the SS shall switch the power settings from T1 to T2 as specified in Table 6.3.1.3.5-1. T2 starts.

5. The UE shall transmit RRCReconfigurationComplete message.

6. If the UE transmits the uplink PRACH channel to Cell 2 less than 132 ms from the beginning of time period T2 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

7. After T2 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.

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

9. Repeat step 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.3.1.3.4.3 Message contents

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

Table 6.3.1.3.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.2-2 with Condition RBConfig_KeyChange

6.3.1.3.5 Test requirements

Table 6.3.1.3.5-1 defines the primary level settings including test tolerances for all tests.

Table 6.3.1.3.5-1: Cell specific test parameters for NR FR1-FR1 Intra frequency handover test case

Parameter		Unit	Cell 1		Cell 2	
			T1	T2	T1	T2
NR RF Channel Number			1		2	
Duplex mode	Config 1		FDD			
	Config 2,3		TDD			
TDD configuration	Config 1		Not Applicable			
	Config 2		TDDConf.1.1			
	Config 3		TDDConf.2.1			
BW$_{channel}$	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			
SMTC configuration	Config 1,2		SMTC.1 FR1			
	Config 3		SMTC.2 FR1			
PDSCH/PDCCH subcarrier spacing	Config 1,2	kHz	15 kHz			
	Config 3		30 kHz			
PUCCH/PUSCH subcarrier spacing	Config 1,2	kHz	15 kHz			
	Config 3		30 kHz			
PRACH configuration			FR1 PRACH configuration 1			

Parameter		Unit	Cell 1		Cell 2	
			T1	T2	T1	T2
BWP	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			
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
N_{oc} Note2		dBm/15kHz	-98		-98	
N_{oc} Note2	Config 1,2	dBm/SCS	-98		-98	
	Config 3		-95		-95	
$\hat{E}_s / I_{ot}$		dB	4	4	-Infinity	6.7
$\hat{E}_s / N_{oc}$		dB	4	4	-Infinity	6.7
SSB_RP	Config 1,2	dBm/SCS	-94	-94	-Infinity	-91.3
	Config 3	dBm/SCS	-91	-91	-Infinity	-88.3
Io Note3	Config 1,2	dBm/ 9.36MHz	-64.59	-64.59	-70.05	-62.51
	Config 3	dBm/ 38.16MHz	-58.49	-58.49	-63.94	-56.40
Propagation condition		-	AWGN		AWGN	
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.						
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be 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.						

The UE shall start to transmit the PRACH to Cell 2 less than 132 ms from the beginning of time period T2.
The rate of correct handovers observed during repeated tests shall be at least 90%.

   NOTE: The handover delay can be expressed as: RRC procedure delay + $T_{interrupt}$, where:

   RRC procedure delay = 10 ms and is specified in clause 12 in TS 38.331 [2].

   $T_{interrupt}$ = 122 ms in the test. $T_{interrupt}$ is defined in clause 6.3.1.0.2.

This gives a total of 132 ms.

6.3.1.4   NR SA FR1 – E-UTRA handover with known target cell

6.3.1.4.1   Test purpose

To verify that the UE can make correct inter-RAT E-UTRAN handover when operating in standalone (SA) operation with PCell in FR1.

6.3.1.4.2   Test applicability

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

6.3.1.4.3   Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.4.

6.3.1.4.4   Test description

6.3.1.4.4.1   Initial conditions

The Test shall be tested using any of the test configuration in Table 6.3.1.4.4.1-1.

Table 6.3.1.4.4.1-1: Supported test configurations

Configuration	Description
6.3.1.4-1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode, LTE FDD
6.3.1.4-2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode, LTE FDD
6.3.1.4-3	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode, LTE FDD
6.3.1.4-4	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode, LTE TDD
6.3.1.4-5	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode, LTE TDD
6.3.1.4-6	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode, LTE TDD
Note:	The UE is only required to be tested in one of the supported test configurations.

Configure the test requirement and the DUT according to the parameters in Table 6.3.1.4.4.1-2.

Table 6.3.1.4.4.1-2: Initial conditions for NR SA FR1 – E-UTRA handover with known target cell

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.3.1.4.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
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 6.3.1.4.4.1-3.

2. Message contents are defined in clause 6.3.1.4.4.3.

3. The test comprises of one NR carrier and one E-UTRA carrier. There are two cells and one cell on each carrier. Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1.

Table 6.3.1.4.4.1-3: General test parameters for SA inter-RAT E-UTRAN handover

Parameter		Unit	Value	Comment
NR RF Channel Number			1	1 NR carrier frequency is used in the test
LTE RF Channel Number			2	1 E-UTRAN carrier frequency is used in the test
Initial conditions	Active cell		Cell 1	NR cell
	Neighbouring cell		Cell 2	E-UTRAN cell
Final condition	Active cell		Cell 2	
NR measurement quantity			SS-RSRP	
E-UTRAN measurement quantity			RSRP	
b2-Threshold1		dBm	As specified in Table 6.3.1.4.5-1	Absolute NR SS-RSRP threshold for event B2
b2-Threshold2EUTRAN		dBm	-98	Absolute E-UTRAN RSRP threshold for event B2
Hysteresis		dB	0	
TimeToTrigger		s	0	
Filter coefficient			0	L3 filtering is not used
DRX			OFF	Non-DRX test
Access Barring Information		-	Not sent	No additional delays in random access procedure
Time offset between cells			3 ms	Asynchronous cells
Gap pattern configuration Id			0	As specified in TS 38.133 [6], table 9.1.2-1 started before T2 starts
T1		s	5	
T2		s	≤5	
T3		s	1	

6.3.1.4.4.2 Test procedure

The test comprises of one NR carrier and one E-UTRA carrier. There are two cells and one cell on each carrier. Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN neighbour cell. The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable and the UE is expected to detect and send a measurement report. Gap pattern configuration with id #0 as specified in Table 9.1.2-1 of TS 38.133 [6] is configured before T2 begins to enable inter-RAT frequency monitoring.

A RRC message implying handover shall be sent to the UE during period T2 after the UE has reported Event B2. The start of T3 is the instant when the last TTI containing the RRC message implying handover is sent to the UE. The handover message shall contain Cell 2 as the target cell.

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. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 6.3.1.4.5-1 and 6.3.1.4.5-2. T1 starts.

3. The SS shall transmit an RRCReconfiguration message.

4. The UE shall transmit RRCReconfigurationComplete message.

5. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 6.3.1.4.5-1 and 6.3.1.4.5-2.

6. UE shall transmit a MeasurementReport message triggered by Event B2.

7. SS shall transmit an RRCReconfiguration message implying handover to Cell 2.

8. The start of T3 is the instant when the last TTI containing the RRCReconfiguration message implying handover is sent to the UE, at that instant the SS shall switch the power setting from T2 to T3 as specified in Table 6.3.1.4.5-1 and 6.3.1.4.5-2.

9. The UE shall transmit RRCConnectionReconfigurationComplete message on Cell 2.

10. If the UE transmits the uplink PRACH channel to Cell 2 less than 85 ms from the beginning of time period T3 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

11. After T3 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in State 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.

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

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

6.3.1.4.4.3 Message contents

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

Table 6.3.1.4.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTER-RAT and GAP NEEDED Table H.3.1-3A Table H.3.1-4A Table H.3.1-5 Table H.3.1-6 with Condition Pattern #0 Table H.3.1-7 with Condition INTER-RAT Table H.3.3-1
Specific message contents exceptions for Test Configuration 6.3.1.4-1, 6.3.1.4-2, 6.3.1.4-4 and 6.3.1.4-5	Table H.3.1-3 with Condition SSB.1 FR1 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1
Specific message contents exceptions for Test Configuration 6.3.1.4-3 and 6.3.1.4-6	Table H.3.1-3 with Condition SSB.2 FR1 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 6.3.1.4.4.3-2: *PRACH-Config-DEFAULT*: Inter-RAT handover to E-UTRAN known cell

Derivation Path: TS 36.508 [25], Table 4.6.3-7			
Information Element	**Value/remark**	**Comment**	**Condition**
PRACH-Config-DEFAULT ::= SEQUENCE {			
prach-ConfigInfo SEQUENCE {			
prach-ConfigIndex	4		Config 1, 2, 3
	53		Config 4, 5, 6
}			
}			

Table 6.3.1.4.4.3-3: *RRCConnectionReconfiguration***: Inter-RAT handover to E-UTRAN known cell**

Derivation Path: TS 36.508 [25], Table 4.6.1-8			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCConnectionReconfiguration ::= SEQUENCE {			
securityConfigHO	Not present		
nonCriticalExtension SEQUENCE {		RRCConnectionReconfiguration-v890-IEs	
nonCriticalExtension SEQUENCE {		RRCConnectionReconfiguration-v920-IEs	
nonCriticalExtension SEQUENCE {		RRCConnectionReconfiguration-v1020-IEs	
nonCriticalExtension SEQUENCE {		RRCConnectionReconfiguration-v1130-IEs	
nonCriticalExtension SEQUENCE {		RRCConnectionReconfiguration-v1250-IEs	
nonCriticalExtension SEQUENCE {		RRCConnectionReconfiguration-v1310-IEs	
nonCriticalExtension SEQUENCE {		RRCConnectionReconfiguration-v1430-IEs	
nonCriticalExtension SEQUENCE {		RRCConnectionReconfiguration-v1510-IEs	
nonCriticalExtension SEQUENCE {		RRCConnectionReconfiguration-v1530-IEs	
securityConfigHO-v1530 {			
handoverType-v1530 CHOICE {	fivegc-ToEPC-r15		
fivegc-ToEPC-r15 {			
securityAlgorithmConfig-r15 {			
cipheringAlgorithm	eea0		
integrityProtAlgorithm	eia1		
}			
nextHopChainingCount-r15	2		
}			
}			
}			
}			
}			
}			
}			
}			
}			
}			
}			
}			

6.3.1.4.5 Test requirement

Tables 6.3.1.4.4.1-3, 6.3.1.4.5-1 and 6.3.1.4.5-2 define the primary level settings including test tolerances for intra frequency NR cell re-selection test case.

Table 6.3.1.4.5-1: Cell specific test parameters for SA inter-RAT E-UTRA handover (Cell 1)

Parameter	Unit	Configuration	Cell 1		
			T1	T2	T3
RF channel number		1, 2, 3, 4, 5, 6	1		
Duplex mode		1, 4	FDD		
		2, 3, 5, 6	TDD		

Parameter		Unit	Configuration	Cell 1		
				T1	T2	T3
TDD Configuration			2, 5	TDDConf.1.1		
			3, 6	TDDConf.2.1		
BW$_{channel}$		MHz	1, 4	10: N$_{RB,c}$ = 52 (FDD)		
			2, 5	10: N$_{RB,c}$ = 52 (TDD)		
			3, 6	40: N$_{RB,c}$ = 106 (TDD)		
PDSCH reference measurement channel			1, 4	SR.1.1 FDD		
			2, 5	SR.1.1 TDD		
			3, 6	SR.2.1 TDD		
CORSET reference channel			1, 4	CR.1.1 FDD		
			2, 5	CR.1.1 TDD		
			3, 6	CR.2.1 TDD		
OCNG pattern[Note1]			1, 2, 3, 4, 5, 6	OP.1		
BWP	Initial DL BWP		1, 2, 3, 4, 5, 6	DL BWP.0.1		
	Dedicated DL BWP			DL BWP.1.1		
	Initial UL BWP			UL BWP.0.1		
	Dedicated UL BWP			UL BWP.1.1		
SMTC configuration			1, 2, 3, 4, 5, 6	SMTC.1		
SSB configuration			1, 2, 4, 5	SSB.1 FR1		
			3, 6	SSB.2 FR1		
b2-Threshold1		dBm	1, 2, 4, 5	-96		
			3, 6	-93		
EPRE ratio of PSS to SSS		dB	1, 2, 3, 4, 5, 6	0		
EPRE ratio of PBCH_DMRS to SSS						
EPRE ratio of PBCH to PBCH_DMRS						
EPRE ratio of PDCCH_DMRS to SSS						
EPRE ratio of PDCCH to PDCCH_DMRS						
EPRE ratio of PDSCH_DMRS to SSS						
EPRE ratio of PDSCH to PDSCH_DMRS						
EPRE ratio of OCNG DMRS to SSS						
EPRE ratio of OCNG to OCNG DMRS						
N$_{oc}$[Note2]		dBm/15 KHz	1, 2, 3, 4, 5, 6	-100	-104	-100
N$_{oc}$[Note2]		dBm/SCS	1, 2, 4, 5	-100	-104	-100
			3, 6	-97	-101	-97
Ê$_s$/N$_{oc}$		dB	1, 2, 3, 4, 5, 6	13.55	-1.55	-5.55
Ê$_s$/I$_{ot}$[Note3]		dB	1, 2, 3, 4, 5, 6	13.55	-1.55	-5.55
SS-RSRP[Note3]		dBm/SCS	1, 2, 4, 5	-86.45	-105.55	-105.55
			3, 6	-83.44	-102.54	-102.54
I$_o$[Note3]		dBm/9.36 MHz	1, 2, 4, 5	-58.31	-73.04	-70.98
		dBm/38.16 MHz	3, 6	-52.21	-66.94	-64.88
Propagation condition			1, 2, 3, 4, 5, 6	AWGN		
Antenna Configuration and Correlation Matrix			1, 2, 3, 4, 5, 6	1x2 Low		
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.						
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N$_{oc}$ to be fulfilled.						
Note 3: Ê$_s$/I$_{ot}$, SS-RSRP, and I$_o$ levels have been derived from other parameters for information purposes. They are not settable parameters themselves.						

Table 6.3.1.4.5-2: Cell specific test parameters for SA inter-RAT E-UTRA handover (Cell 2)

Parameter	Unit	Configuration	Cell 2		
			T1	T2	T3
RF channel number		1, 2, 3, 4, 5, 6	2		
Duplex mode		1, 2, 3	FDD		
		4, 5, 6	TDD		
TDD special subframe configuration[Note1]		4, 5, 6	6		
TDD uplink-downlink configuration[Note1]		4, 5, 6	1		
BW$_{channel}$	MHz	1, 2, 3, 4, 5, 6	5MHz: N$_{RB,c}$ = 25 10MHz: N$_{RB,c}$ = 50 20MHz: N$_{RB,c}$ = 100		
PRACH Configuration[Note2]		1, 2, 3	4		
		4, 5, 6	53		
PDSCH parameters: DL Reference Measurement Channel[Note3]		1, 2, 3	5MHz: R.7 FDD 10MHz: R.3 FDD 20MHz: R.6 FDD		
		4, 5, 6	5MHz: R.4 TDD 10MHz: R.0 TDD 20MHz: R.3 TDD		
PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel[Note3]		1, 2, 3	5MHz: R.11 FDD 10MHz: R.6 FDD 20MHz: R.10 FDD		
		4, 5, 6	5MHz: R.11 TDD 10MHz: R.6 TDD 20MHz: R.10 TDD		
OCNG Patterns[Note3]		1, 2, 3	5MHz: OP.20 FDD 10MHz: OP.10 FDD 20MHz: OP.17 FDD		
		4, 5, 6	5MHz: OP.9 TDD 10MHz: OP.1 TDD 20MHz: OP.7 TDD		
PBCH_RA PBCH_RB PSS_RA SSS_RA PCFICH_RB PHICH_RA PHICH_RB PDCCH_RA PDCCH_RB PDSCH_RA PDSCH_RB OCNG_RA[Note4] OCNG_RB[Note4]	dB	1, 2, 3, 4, 5, 6	0		
N$_{oc}$[Note5]	dBm/15kHz	1, 2, 3, 4, 5, 6	-98		
Ê$_s$/N$_{oc}$	dB	1, 2, 3, 4, 5, 6	-Infinity	9.55	9.55
Ê$_s$/I$_{ot}$[Note6]	dB	1, 2, 3, 4, 5, 6	-Infinity	9.55	9.55
RSRP[Note6]	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-88.45	-88.45
SCH_RP[Note6]	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-88.45	-88.45
Io[Note6]	dBm/Ch BW	1, 2, 3, 4, 5, 6	-67.21 +10log (N$_{RB,c}$ /100)	-57.20 +10log (N$_{RB,c}$ /100)	-57.20 +10log (N$_{RB,c}$ /100)
Propagation Condition		1, 2, 3, 4, 5, 6	AWGN		
Antenna Configuration and Correlation Matrix [Note7]		1, 2, 3, 4, 5, 6	1x2 Low		

Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211.
Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211.
Note 3: DL RMCs and OCNG patterns are specified in sections A 3.1 and A 3.2 of TS 36.133 respectively.
Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N$_{oc}$ to be fulfilled.
Note 6: Ê$_s$/I$_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Parameter	Unit	Configuration	Cell 2		
			T1	T2	T3
Note 7: Propagation condition and correlation matrix are defined in section B.2 in TS 36.101 [27].					

The UE shall start to transmit the PRACH to Cell 2 less than 85 ms from the beginning of time period T3.

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

> NOTE: The handover delay can be expressed as: RRC procedure delay + $T_{interrupt}$, where:
>
> RRC procedure delay = 50 ms and is specified in section 6.1.2.1 of TS 38.133 [6].
>
> $T_{interrupt}$ = 35 ms in the test; $T_{interrupt}$ is defined in section 6.1.2.1 of TS 38.133 [6].

This gives a total of 85 ms.

6.3.1.5 NR SA FR1 – E-UTRA handover with unknown target cell

6.3.1.5.1 Test purpose

To verify that the UE can make correct inter-RAT E-UTRAN handover when operating in standalone (SA) operation with PCell in FR1. This test shall verify the NR to E-UTRAN handover requirements for the case when the target E-UTRAN cell is unknown as specified in section 6.1.2.1 of TS 38.133 [6].

6.3.1.5.2 Test applicability

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

6.3.1.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.2.

6.3.1.5.4 Test description

6.3.1.5.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 6.3.1.5.4.1-1.

Table 6.3.1.5.4.1-1: Supported test configurations for SA inter-RAT E-UTRAN handover tests

Configuration	Description
6.3.1.5-1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode, LTE FDD
6.3.1.5-2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode, LTE FDD
6.3.1.5-3	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode, LTE FDD
6.3.1.5-4	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode, LTE TDD
6.3.1.5-5	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode, LTE TDD
6.3.1.5-6	NR 30kHz SSB SCS, 40MHz bandwidth, TDD duplex mode, LTE TDD
Note: The UE is only required to be tested in one of the supported test configurations.	

Configure the test requirement and the DUT according to the parameters in Table 6.3.1.5.4.1-2.

Table 6.3.1.5.4.1-2: Initial conditions for NR SA FR1 – E-UTRA handover with unknown target cell

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.3.1.5.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
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 6.3.1.5.4.1-3.

2. Message contents are defined in clause 6.3.1.5.4.3.

3. The test comprises of one NR carrier and one E-UTRA carrier. There are two cells and one cell on each carrier. Cell 1 is the NR PCell and Cell 2 is the E-UTRAN neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2. Cell 2 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1.

Table 6.3.1.5.4.1-3: General test parameters for SA inter-RAT E-UTRAN handover

Parameter		Unit	Value	Comment
NR RF Channel Number			1	1 NR carrier frequency is used in the test
LTE RF Channel Number			2	1 E-UTRAN carrier frequency is used in the test
Initial conditions	Active cell		Cell 1	NR cell
	Neighbouring cell		Cell 2	E-UTRAN cell
Final condition	Active cell		Cell 2	
NR measurement quantity			SS-RSRP	
E-UTRAN measurement quantity			RSRP	
DRX			OFF	Non-DRX test
Access Barring Information		-	Not sent	No additional delays in random access procedure
Time offset between cells			3 ms	Asynchronous cells
T1		s	≤5	
T2		s	1	

6.3.1.5.4.2 Test procedure

The test comprises of one NR carrier and one E-UTRA carrier. There are two cells and one cell on each carrier. Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN neighbour cell. The test consists of two successive time periods, with time durations of T1 and T2. At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable. No Gap pattern shall be configured.

An RRC message implying handover shall be sent to the UE during period T1. The start of T2 is the instant when the last subframe containing the RRC message implying handover is sent to the UE. Starting T2, Cell 2 becomes detectable and the UE is expected to detect and start to transmit the PRACH to Cell 2.

1. Ensure the UE is in State 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. Establish SRB2 and DRB in the RRC Reconfiguration message. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 6.3.1.5.5-1 and 6.3.1.5.5-2. T1 starts.

3. SS shall transmit an RRCReconfiguration message implying handover to Cell 2.

4. The start of T2 is the instant when the last subframe containing the RRC Reconfiguration message implying handover is sent to the UE, at that instant the SS shall switch the power settings from T1 to T2 as specified in Table 6.3.1.5.5-1 and 6.3.1.5.5-2. T2 starts.

5. The UE shall transmit RRCConnectionReconfigurationComplete message on Cell 2.

6. If the UE transmits the uplink PRACH channel to Cell 2 less than 165 ms from the beginning of time period T2 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

7. After T2 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.

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

9. Repeat step 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

6.3.1.5.4.3   Message contents

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

Table 6.3.1.5.4.3-1: Common Exception messages

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.3-1

Table 6.3.1.5.4.3-2: *PRACH-Config-DEFAULT*: Inter-RAT handover to E-UTRAN unknown cell

Derivation Path: TS 36.508 [25], Table 4.6.3-7			
Information Element	**Value/remark**	**Comment**	**Condition**
PRACH-Config-DEFAULT ::= SEQUENCE {			
prach-ConfigInfo SEQUENCE {			
prach-ConfigIndex	4		Config 1, 2, 3
	53		Config 4, 5, 6
}			
}			

6.3.1.5.5   Test requirement

Tables 6.3.1.5.4.1-3, 6.3.1.5.5-1 and 6.3.1.5.5-2 define the primary level settings including test tolerances for inter-RAT E-UTRAN handover: unknown target cell test.

Table 6.3.1.5.5-1: Cell specific test parameters for SA inter-RAT E-UTRA handover (Cell 1)

Parameter		Unit	Configuration	Cell 1	
				T1	T2
RF channel number			1, 2, 3, 4, 5, 6	1	
Duplex mode			1, 4	FDD	
			2, 3, 5, 6	TDD	
TDD Configuration			2, 5	TDDConf.1.1	
			3, 6	TDDConf. 2.1	
BW$_{channel}$		MHz	1, 4	10: N$_{RB,c}$ = 52 (FDD)	
			2, 5	10: N$_{RB,c}$ = 52 (TDD)	
			3, 6	40: N$_{RB,c}$ = 106 (TDD)	
PDSCH reference measurement channel			1, 4	SR.1.1 FDD	
			2, 5	SR.1.1 TDD	
			3, 6	SR.2.1 TDD	
CORSET reference channel			1, 4	CR.1.1 FDD	
			2, 5	CR.1.1 TDD	
			3, 6	CR.2.1 TDD	
OCNG pattern[Note1]			1, 2, 3, 4, 5, 6	OP.1	
BWP	Initial DL BWP		1, 2, 3, 4, 5, 6	DLBWP.0.1	
	Dedicated DL BWP			DLBWP.1.1	
	Initial UL BWP			ULBWP.0.1	
	Dedicated UL BWP			ULBWP.1.1	
SMTC configuration			1, 2, 3, 4, 5, 6	SMTC.1	
SSB configuration			1, 2, 4, 5	SSB.1 FR1	
			3, 6	SSB.2 FR1	
EPRE ratio of PSS to SSS			1, 2, 3, 4, 5, 6		
EPRE ratio of PBCH_DMRS to SSS					
EPRE ratio of PBCH to PBCH_DMRS					
EPRE ratio of PDCCH_DMRS to SSS					
EPRE ratio of PDCCH to PDCCH_DMRS		dB		0	
EPRE ratio of PDSCH_DMRS to SSS					
EPRE ratio of PDSCH to PDSCH_DMRS					
EPRE ratio of OCNG DMRS to SSS					
EPRE ratio of OCNG to OCNG DMRS					
N_{oc}[Note2]		dBm/15 KHz	1, 2, 3, 4, 5, 6	-98	
N_{oc}[Note2]		dBm/SCS	1, 2, 4, 5	-98	
			3, 6	-95	
Ê$_s$/N$_{oc}$		dB	1, 2, 3, 4, 5, 6	0	0
Ê$_s$/I$_{ot}$[Note3]		dB	1, 2, 3, 4, 5, 6	0	0
SS-RSRP[Note3]		dBm/SCS	1, 2, 4, 5	-98	-98
			3, 6	-95	-95
Io[Note3]		dBm/9.36 MHz	1, 2, 4, 5	-67.04	-67.04
		dBm/38.16 MHz	3, 6	-60.94	-60.94
Propagation condition			1, 2, 3, 4, 5, 6	AWGN	
Antenna Configuration and Correlation Matrix			1, 2, 3, 4, 5, 6	1x2 Low	
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.					
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.					
Note 3: Ê$_s$/I$_{ot}$, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.					

Table 6.3.1.5.5-2: Cell specific test parameters for SA inter-RAT E-UTRA handover (Cell 2)

Parameter	Unit	Configuration	Cell 2	
			T1	T2
RF channel number		1, 2, 3, 4, 5, 6	2	
Duplex mode		1, 2, 3	FDD	
		4, 5, 6	TDD	
TDD special subframe configuration[Note1]		4, 5, 6	6	
TDD uplink-downlink configuration[Note1]		4, 5, 6	1	
$BW_{channel}$	MHz	1, 2, 3, 4, 5, 6	5MHz: $N_{RB,c}$ = 25 10MHz: $N_{RB,c}$ = 50 20MHz: $N_{RB,c}$ = 100	
PRACH Configuration[Note2]		1, 2, 3	4	
		4, 5, 6	53	
PDSCH parameters: DL Reference Measurement Channel[Note3]		1, 2, 3	5MHz: R.7 FDD 10MHz: R.3 FDD 20MHz: R.6 FDD	
		4, 5, 6	5MHz: R.4 TDD 10MHz: R.0 TDD 20MHz: R.3 TDD	
PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel[Note3]		1, 2, 3	5MHz: R.11 FDD 10MHz: R.6 FDD 20MHz: R.10 FDD	
		4, 5, 6	5MHz: R.11 TDD 10MHz: R.6 TDD 20MHz: R.10 TDD	
OCNG Patterns[Note3]		1, 2, 3	5MHz: OP.20 FDD 10MHz: OP.10 FDD 20MHz: OP.17 FDD	
		4, 5, 6	5MHz: OP.9 TDD 10MHz: OP.1 TDD 20MHz: OP.7 TDD	
PBCH_RA PBCH_RB PSS_RA SSS_RA PCFICH_RB PHICH_RA PHICH_RB PDCCH_RA PDCCH_RB PDSCH_RA PDSCH_RB OCNG_RA[Note4] OCNG_RB[Note4]	dB	1, 2, 3, 4, 5, 6	0	
N_{oc}[Note5]	dBm/15kHz	1, 2, 3, 4, 5, 6	-98	
$\hat{E}_s/N_{oc}$	dB	1, 2, 3, 4, 5, 6	-Infinity	7
$\hat{E}_s/I_{ot}$[Note6]	dB	1, 2, 3, 4, 5, 6	-Infinity	7
RSRP[Note6]	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-91
SCH_RP[Note6]	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-91
Io[Note6]	dBm/9MHz	1, 2, 3, 4, 5, 6	-70.22	-62.43
Propagation Condition		1, 2, 3, 4, 5, 6	AWGN	
Antenna Configuration and Correlation Matrix [Note7]		1, 2, 3, 4, 5, 6	1x2 Low	
Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211.				
Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211.				
Note 3: DL RMCs and OCNG patterns are specified in sections A 3.1 and A 3.2 of TS 36.133 respectively.				
Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.				
Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.				
Note 6: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.				
Note 7: Propagation condition and correlation matrix are defined in section B.2 in TS 36.101 [27].				

The UE shall start to transmit the PRACH to Cell 2 less than 165 ms from the beginning of time period T2.

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

NOTE: The handover delay can be expressed as: RRC procedure delay + $T_{interrupt}$, where:

RRC procedure delay = 50 ms and is specified in section 6.1.2.1 of TS 38.133 [6].

$T_{interrupt}$ = 115 ms in the test; $T_{interrupt}$ is defined in section 6.1.2.1 of TS 38.133 [6].

This gives a total of 165 ms.

6.3.1.6 NR SA FR1 – UTRAN FDD handover with known target cell

6.3.1.6.1 Test purpose

To verify that the UE can make correct inter-RAT UTRAN handover when operating in standalone (SA) operation with PCell in FR1.

6.3.1.6.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and support UTRA FDD.

6.3.1.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.6.

6.3.1.6.4 Test description

6.3.1.6.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 6.3.1.6.4.1-1.

Table 6.3.1.6.4.1-1: Supported test configurations

Configuration	Description
6.3.1.6-1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode, UTRAN FDD
6.3.1.6-2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode, UTRAN FDD
6.3.1.6-3	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode, UTRAN FDD
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 6.3.1.6.4.1-2.

Table 6.3.1.6.4.1-2: Initial conditions for NR SA FR1 – UTRAN handover with known target cell

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-3 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.3.1.6.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	UE Part	A.3.2.3.2	
Exceptions to connection diagram	SS LTE in Figure A.3.1.8.2 is replaced by SS UTRA Faders in Figure A.3.1.8.2 are removed. LTE TX/RX in Figure A.3.2.3.2 is replaced by UTRA TX/RX		

1. The general test parameter settings are set up according to Table 6.3.1.6.4.1-3.

2. Message contents are defined in clause 6.3.1.6.4.3.

3. The test comprises of one NR carrier and one UTRAN carrier. There are two cells and one cell on each carrier. Cell 1 is the NR PCell and Cell 2 is an inter-RAT UTRAN neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 Annex C.0 and C.1.

Table 6.3.1.6.4.1-3: General test parameters for SA inter-RAT UTRAN handover

Parameter		Unit	Value	Comment
NR RF Channel Number			1	1 NR carrier frequency is used in the test
UTRA RF Channel Number			2	1 UTRAN carrier frequency is used in the test
Initial conditions	Active cell		Cell 1	NR cell
	Neighbouring cell		Cell 2	UTRAN cell
Final condition	Active cell		Cell 2	
NR measurement quantity			SS-RSRP	
Inter-RAT (UTRAN FDD) measurement quantity			CPICH Ec/N0	
b2-Threshold1		dBm	As specified in Table 6.3.1.6.5-1	Absolute NR SS-RSRP threshold for event B2
b2-Threshold2UTRA-FDD		dB	-18	Absolute UTRAN CPICH Ec/Io threshold for event B2
Hysteresis		dB	0	
TimeToTrigger		s	0	
Filter coefficient			0	L3 filtering is not used
DRX			OFF	Non-DRX test
Access Barring Information		-	Not sent	No additional delays in random access procedure
Time offset between cells			3 ms	Asynchronous cells
Gap pattern configuration Id			0	As specified in TS 38.133 [6] Table 9.1.2-1 started before T2 starts
T1		s	5	
T2		s	≤5	
T3		s	1	

6.3.1.6.4.2 Test procedure

The test comprises of one NR carrier and one UTRAN carrier. There are two cells and one cell on each carrier. Cell 1 is the NR PCell and Cell 2 is an inter-RAT UTRAN neighbour cell. The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE does not have any timing information of Cell 2. Starting T2, Cell 2 becomes detectable and the UE is expected to detect and send a measurement report. Gap pattern configuration with id #0 as specified in Table 9.1.2-1 of TS 38.133 [6] is configured before T2 begins to enable inter-RAT frequency monitoring.

A RRC message implying handover shall be sent to the UE during period T2 after the UE has reported Event B2. The start of T3 is the instant when the last TTI containing the RRC message implying handover is sent to the UE. The handover message shall contain Cell 2 as the target cell.

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. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 6.3.1.6.5-1 and 6.3.1.6.5-2. T1 starts.

3. The SS shall transmit an *RRCReconfiguration* message to configure Event B2 measurement reporting.

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 6.3.1.6.5-1 and 6.3.1.6.5-2.

6. UE shall transmit a *MeasurementReport* message triggered by Event B2.

7. SS shall transmit a *MobilityFromNRCommand* message implying handover to Cell 2.

8. T3 starts when the last TTI containing the *MobilityFromNRCommand* message implying handover is sent to the UE, at that instant the SS shall switch the power setting from T2 to T3 as specified in Table 6.3.1.6.5-1 and 6.3.1.6.5-2.

9. If the UE transmits the uplink PRACH channel to Cell 2 less than 85 ms from the beginning of time period T3 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

10. The UE shall transmit HANDOVER TO UTRAN COMPLETE message on Cell 2.

11. After T3 expires, cause UE handover back to Cell 1 (if the handover fails, switch off the UE) or switch off the UE. Then ensure the UE is in State 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.

12. The SS shall set Cell 2 primary scrambling code = ((current cell 2 primary scrambling code - 50) mod 200 + 100) for next iteration of the test procedure loop.

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

6.3.1.6.4.3 Message contents

Table 6.3.1.6.4.3-1: RRCReconfiguration (Step 3)

Derivation Path: TS 38.508-1 [14] Table 4.6.1-13 with condition NR_MEAS			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration SEQUENCE {			
measConfig	MeasConfig	Table 6.3.1.6.4.3-2	
}			
}			
}			

Table 6.3.1.6.4.3-2: MeasConfig (Table 6.3.1.6.4.3-1)

Information Element	Value/remark	Comment	Condition
Derivation Path: Table H.3.1-2 with condition INTER-RAT and GAP NEEDED			
MeasConfig ::= SEQUENCE {			
measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasObjectToAddMod {	2 entries		
MeasObjectToAddMod[1] SEQUENCE {		entry 1	
measObjectId	1		
measObject CHOICE {			
measObjectNR	MeasObjectNR-DEFAULT specified in Table H.3.1-3 with condition INTRA-FREQ MO		
}			
}			
MeasObjectToAddMod[2] SEQUENCE {		entry 2	
measObjectId	2		
measObject CHOICE {			
measObjectUTRA-FDD-r16	MeasObjectUTRA-FDD	Table 6.3.1.6.4.3-3	
}			
}			
}			
reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod {	1 entry		
ReportConfigToAddMod[1] SEQUENCE {		entry 1	
reportConfigId	1		
reportConfig CHOICE {			
reportConfigInterRAT	ReportConfigInterRAT(*13, 60*) specified in 38.508-1 [14] Table 4.6.3-141 with condition EVENT_B2_UTRA	Actual value of thresholds are: UTRA threshold = (13-49)/2 = -18dB NR threshold = 60-156 = -96dBm	6.6.1.6-1, 6.6.1.6-2
	ReportConfigInterRAT(*13, 63*) specified in 38.508-1 [14] Table 4.6.3-141 with condition EVENT_B2_UTRA	Actual value of thresholds are: UTRA threshold = (13-49)/2 = -18dB NR threshold = 63-156 = -93dBm	6.6.1.6-3
}			
}			
}			
measGapConfig	MeasGapConfig specified in Table H.3.1-6 with condition gapUE and Pattern #0		
}			

Table 6.3.1.6.4.3-3: MeasObjectUTRA-FDD (Table 6.3.1.6.4.3-2)

Information Element	Value/remark	Comment	Condition
Derivation Path: TS 38.508-1 [14], Table 4.6.3-77A			
MeasObjectUTRA-FDD-r16 ::= SEQUENCE {			
carrierFreq-r16	ARFCN-ValueUTRA-FDD-r16 for UTRA Cell 2		
}			

Table 6.3.1.6.4.3-4: MeasurementReport (Step 6)

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	Table 6.3.1.6.4.3-5	
}			
}			
}			

Table 6.3.1.6.4.3-5: MeasResults (Table 6.3.1.6.4.3-4)

Information Element	Value/remark	Comment	Condition
Derivation Path: TS 38.508-1 [14] Table 4.6.3-79 with condition B2_UTRA			
MeasResults ::= SEQUENCE {			
measResultNeighCells CHOICE {			
measResultListUTRA-FDD-r16 SEQUENCE (SIZE (1..maxCellReport)) OF MeasResultUTRA-FDD-r16 {	1 entry		
MeasResultUTRA-FDD-r16[1] SEQUENCE {		entry 1	
physCellId-r16	PhysCellIdUTRA-FDD-r16 of UTRA Cell 2		
measResult-r16 SEQUENCE {			
utra-FDD-EcN0-r16	INTEGER (0..49)		
}			
}			
}			
}			
}			

Table 6.3.1.6.4.3-6: MobilityFromNRCommand (Step 7)

Derivation Path: TS 38.508-1 [14] Table 4.6.1-8 with condition HO-TO-UTRA_FDD

6.3.1.6.5 Test requirement

Tables 6.3.1.6.5-1 and 6.3.1.6.5-2 define the primary level settings including test tolerances for intra frequency NR cell re-selection test case.

Table 6.3.1.6.5-1: Cell specific test parameters for SA inter-RAT UTRAN FDD handover (Cell 1)

Parameter	Unit	Configuration	Cell 1		
			T1	T2	T3
RF channel number		1, 2, 3	1		
Duplex mode		1	FDD		
		2, 3	TDD		
TDD Configuration		2	TDDConf.1.1		
		3	TDDConf.2.1		
BW$_{channel}$	MHz	1	10: N$_{RB,c}$ = 52 (FDD)		
		2	10: N$_{RB,c}$ = 52 (TDD)		
		3	40: N$_{RB,c}$ = 106 (TDD)		
PDSCH reference measurement channel		1	SR.1.1 FDD		
		2	SR.1.1 TDD		
		3	SR.2.1 TDD		
CORSET reference channel		1	CR.1.1 FDD		
		2	CR.1.1 TDD		
		3	CR.2.1 TDD		
TRS configuration		1	TRS.1.1 FDD		
		2	TRS.1.1 TDD		
		3	TRS.1.2 TDD		

Parameter		Unit	Configuration	Cell 1		
				T1	**T2**	**T3**
OCNG pattern[Note1]			1, 2, 3	OP.1		
BWP	Initial DL BWP		1, 2, 3	DLBWP.0.1		
	Dedicated DL BWP			DLBWP.1.1		
	Initial UL BWP			ULBWP.0.1		
	Dedicated UL BWP			ULBWP.1.1		
SMTC configuration			1, 2, 3	SMTC.1		
SSB configuration			1, 2	SSB.1 FR1		
			3	SSB.2 FR1		
b2-Threshold1		dBm	1, 2	-96		
			3	-93		
EPRE ratio of PSS to SSS		dB	1, 2, 3	0		
EPRE ratio of PBCH_DMRS to SSS						
EPRE ratio of PBCH to PBCH_DMRS						
EPRE ratio of PDCCH_DMRS to SSS						
EPRE ratio of PDCCH to PDCCH_DMRS						
EPRE ratio of PDSCH_DMRS to SSS						
EPRE ratio of PDSCH to PDSCH_DMRS						
EPRE ratio of OCNG DMRS to SSS						
EPRE ratio of OCNG to OCNG DMRS						
N_{oc}[Note2]		dBm/15 KHz	1, 2, 3	-101.54		
N_{oc}[Note2]		dBm/SCS	1, 2,	-101.54		
			3	-98.54		
$\hat{E}_s/N_{oc}$		dB	1, 2, 3	12	-4	-4
$\hat{E}_s/I_{ot}$[Note3]		dB	1, 2, 3	12	-4	-4
SS-RSRP[Note3]		dBm/SCS	1, 2	-89.54	-105.54	-105.54
			3	-86.54	-102.54	-102.54
Io[Note3]		dBm/9.36 MHz	1, 2	-61.32	-72.13	-72.13
		dBm/38.16 MHz	3	-55.22	-66.03	-66.03
Propagation condition			1, 2, 3	AWGN		
Antenna Configuration and Correlation Matrix			1, 2, 3	1x2 Low		
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.						
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.						
Note 3: $\hat{E}_s/I_{ot}$, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.						

Table 6.3.1.6.5-2: Cell specific test parameters for SA inter-RAT UTRAN FDD handover (Cell 2)

Parameter	Unit	Cell 2 (UTRA)		
		T1	T2	T3
UTRA RF Channel Number		2		
CPICH_Ec/Ior	dB	-10		
PCCPCH_Ec/Ior	dB	-12		
SCH_Ec/Ior	dB	-12		
PICH_Ec/Ior	dB	-15		
DCH_Ec/Ior	dB	N/A	N/A	Note 1
OCNS_Ec/Ior	dB	-0.941	0.941	Note 2
$\hat{I}_{or}/I_{oc}$	dB	-infinity	-1.8	-1.8
I_{oc}	dBm/3,84 MHz	-70	-70	-70
CPICH_Ec/Io	dB	-infinity	-14	-14
Propagation Condition		AWGN		
Note 1: The DPCH level is controlled by the power control loop				
Note 2: The power of the OCNS channel that is added shall make the total power from the cell to be equal to I$_{or}$.				

The UE shall start to transmit the UL DPCCH to Cell 2 less than 190 ms from the beginning of time period T3.

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

NOTE: The handover delay can be expressed as: RRC procedure delay + T$_{interrupt}$, where:

RRC procedure delay = 50 ms, which is specified in clause 5.3.1.1.1.

T$_{interrupt}$ = 140 ms in the test; T$_{interrupt}$ is defined in clause 5.3.1.1.2. This gives a total of 190 ms.

6.3.1.7 NR SA FR1 synchronous DAPS handover

6.3.1.7.1 Test purpose

To verify the requirement for the NR FR1-NR FR1 intra frequency DAPS handover requirements in synchronous scenario specified in clause 38.133 [6] clause 6.1.3.2.

6.3.1.7.2 Test applicability

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

6.3.1.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.7.

6.3.1.7.4 Test description

6.3.1.7.4.1 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 6.3.1.7.4.1-1.

Table 6.3.1.7.4.1-1: NR SA FR1 synchronous DAPS handover test configurations

Config	Description
6.3.1.7-1	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
	Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.3.1.7-2	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
	Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6.3.1.7-3	Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
	Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note:	The UE is only required to be tested in one of the supported test configurations

Configure the test equipment and the DUT according to the parameters in Table 6.3.1.7.4.1-2

Table 6.3.1.7.4.1-2: Initial conditions for NR SA FR1 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, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.3.1.7.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 6.3.1.7.4.3.

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 FR1 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 6.3.1.7.4.1-3 below, with A3-Offset modified by Test Tolerance.

Table 6.3.1.7.4.1-3: General test parameters for NR SA FR1 synchronous DAPS handover

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
A3-Offset		dB	-1	
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	≤5	
T3		s	1	
T4		ms	$D_{handover2}$	$D_{Handover2}$ is defined in TS 38.133 [6] clause 6.1.3.2.1
T5		ms	100	

6.3.1.7.4.2 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 6.3.1.7.4.1-3 and 6.3.1.7.5-1 respectively. No measurement gap is configured in the test case. Both Cell 1 and Cell 2 belong to the same TAG.

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.

From start of T2, the Cell 2 becomes detectable. During T2, the UE performs cell detection and measurements on the Cell 2 and shall send event report to the network. After receiving the event report A3, the network sends a RRC message implying DAPS handover command for target cell addition to the UE.

T3 starts from the instant when 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 reception or UL transmission in the Cell 2 while the DL scheduling and UL feedback in the Cell 1 shall be avoided. 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 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 *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 6.3.1.7.5-1. 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 A3 triggered measurement reporting on the intra-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 6.3.1.7.5-1.

7. UE shall transmit a *MeasurementReport* message triggered by Event A3.

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 shall switch the power settings from T2 to T3 as specified in Table 6.3.1.7.5-1. 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:

   - $D_{handover1}$ = 72 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.

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.

6.3.1.7.4.3 Message contents

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

Table 6.3.1.7.4.3-1: 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 6.3.1.7.4.3-3	
nonCriticalExtension SEQUENCE {			
masterCellGroup SEQUENCE {			
spCellConfigDedicated	ServingCellConfig	Table 6.3.1.7.4.3-2	
}			
}			
}			
}			
}			

Table 6.3.1.7.4.3-2: ServingCellConfig (Table 6.3.1.7.4.3-1)

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 6.3.1.7.4.3-3: MeasConfig (Table 6.3.1.7.4.3-1)

Information Element	Value/Remark	Comment	Condition
Derivation path: Table H.3.1-2			
measConfig ::= SEQUENCE {			
reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE {	1 entry		
reportConfig[1] CHOICE {			
reportConfigNR	ReportConfigNR(-1) specified in Table H.3.1-4	Acutal value of A3-offset is -1dB	
}			
}			
}			

Table 6.3.1.7.4.3-4: 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 INTRA-FREQ		
}			
}			
}			

Table 6.3.1.7.4.3-5: 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 6.3.1.7.4.3-6	
nonCriticalExtension SEQUENCE{			
masterCellGroup	CellGroupConfig	Table 6.3.1.7.4.3-7	
}			
}			
}			
}			

Table 6.3.1.7.4.3-6: RadioBearerConfig (Table 6.3.1.7.4.3-5)

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 6.3.1.7.4.3-7: CellGroupConfig (Table 6.3.1.7.4.3-6)

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 6.3.1.7.4.3-8: RRCReconfiguration (Step 12)

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

6.3.1.7.5 Test requirements

Table 6.3.1.7.5-1 defines the primary level settings including test tolerances for all tests.

Table 6.3.1.7.5-1: Cell specific test parameters for NR SA FR1 synchronous DAPS handover

Parameter		Unit	Cell 1		Cell 2	
			T1	T2 – T5	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			
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			
TRS configuration	Config 1		TRS.1.1 FDD			
	Config 2		TRS.1.1 TDD			
	Config 3		TRS.1.2 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		N/A	
reportQuantity			cri-RI-PMI-CQI		N/A	
CSI reporting periodicity	Config 1,2	slot	5		N/A	
	Config 3		10		N/A	
CSI reporting offset	Config 1,2	slot	3		N/A	
	Config 3		5		N/A	
SMTC Configuration			SMTC.1			
SSB Configuration	Config 1,2		SSB.1 FR1			
	Config 3		SSB.2 FR1			
PDSCH/PDCCH subcarrier spacing	Config 1,2	kHz	15 kHz			
	Config 3		30 kHz			
PUCCH/PUSCH subcarrier spacing	Config 1,2	kHz	15 kHz			
	Config 3		30 kHz			
PRACH configuration			FR1 PRACH configuration 1			
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			
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						

N_{oc} Note2		dBm/15kHz	-98			
N_{oc} Note2	Config 1,2	dBm/SCS	-98			
	Config 3		-95			
$\hat{E}_s / I_{ot}$		dB	8	-2.41	-Infinity	1.36
$\hat{E}_s / N_{oc}$		dB	8	8	-Infinity	10
SSB_RP	Config 1,2	dBm/SCS	-90	-90	-Infinity	-88
	Config 3	dBm/SCS	-87	-87	-Infinity	-85
Io Note3	Config 1,2	dBm/ 9.36MHz	-61.41	-57.67	-61.41	-57.67
	Config 3	dBm/ 38.16MHz	-55.31	-51.56	-55.31	-51.56
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 Noc to be fulfilled.					
Note 3:	Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.					

The UE shall start to transmit the PRACH to Cell 2 less than $D_{handover1}$ from the beginning of time period T3. 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 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.

- $T_{processing} = 20$ 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 72 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;

- $T_{interrupt2} = 1$ 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 ms.

UE shall not report CSI to Cell 1 during T5.

6.3.1.8 NR SA FR1 asynchronous DAPS handover

6.3.1.8.1 Test purpose

To verify the requirement for the NR FR1-NR FR1 intra-frequency DAPS handover requirements in asynchronous scenario specified in clause 38.133 [6] clause 6.1.3.2.

6.3.1.8.2   Test applicability

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

6.3.1.8.3   Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.8.

6.3.1.8.4   Test description

6.3.1.8.4.1   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 6.3.1.8.4.1-1.

Table 6.3.1.8.4.1-1: NR SA FR1 asynchronous DAPS handover test configurations

Config	Description
6.3.1.8-1	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.3.1.8-2	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6.3.1.8-3	Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations	

Configure the test equipment and the DUT according to the parameters in Table 6.3.1.8.4.1-2

Table 6.3.1.8.4.1-2: Initial conditions for NR SA FR1 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, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.3.1.8.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 6.3.1.8.4.3.

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 FR1 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 6.3.1.8.4.1-3 below, with A3-Offset modified by Test Tolerance.

Table 6.3.1.8.4.1-3: General test parameters for NR SA FR1 asynchronous DAPS handover

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
A3-Offset		dB	-1	
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			7 μs	Asynchronous cells
T1		s	5	
T2		s	$\leq$5	
T3		s	1	
T4		ms	$D_{handover2}$	$D_{Handover2}$ is defined in clause 6.1.3.2.1
T5		ms	100	

6.3.1.8.4.2   Test procedure

Same test procedure as described in section 6.3.1.7.4.2.

6.3.1.8.4.3   Message contents

Same message contents as described in section 6.3.1.7.4.3.

6.3.1.8.5   Test requirements

Table 6.3.1.8.5-1 defines the primary level settings including test tolerances for all tests.

Table 6.3.1.8.5-1: Cell specific test parameters for NR SA FR1 asynchronous DAPS handover

Parameter		Unit	Cell 1		Cell 2	
			T1	T2 – T5	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 1,2	MHz	10: $N_{RB,c}$ = 52			
	Config 3		40: $N_{RB,c}$ = 106			
BWP BW	Config 1	MHz	10: $N_{RB,c}$ = 52			
	Config 3		40: $N_{RB,c}$ = 106			
DRX Cycle		ms	Not Applicable			
PDSCH Reference measurement channel	Config 1		SR.1.1 FDD			
	Config 2		SR.1.1 TDD			
	Config 3		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			
TRS configuration	Config 1		TRS.1.1 FDD			
	Config 2		TRS.1.1 TDD			
	Config 3		TRS.1.2 TDD			
OCNG Patterns			OP.1			
CSI-RS CSI configuration for reporting	Config 1		CSI-RS.1.1 FDD			
	Config 2		CSI-RS.1.1 TDD			
	Config 3		CSI-RS.2.1 TDD			
reportConfigType			periodic		N/A	
reportQuantity			cri-RI-PMI-CQI		N/A	
CSI reporting periodicity	Config 1,2	slot	5		N/A	
	Config 3		10		N/A	
CSI reporting offset	Config 1,2	slot	3		N/A	
	Config 3		5		N/A	
SMTC Configuration			SMTC.1			
SSB Configuration	Config 1,2		SSB.1 FR1			
	Config 3		SSB.2 FR1			
PDSCH/PDCCH subcarrier spacing	Config 1,2	kHz	15			
	Config 3		30			
PUCCH/PUSCH subcarrier spacing	Config 1,2	kHz	15			
	Config 3		30			
PRACH configuration			FR1 PRACH configuration 1			
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			
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
N_{oc} Note2		dBm/15kHz	-98			
	Config 1,2	dBm/SCS	-98			

N_{oc} Note2	Config 3		-95			
$\hat{E}_s/I_{ot}$		dB	8	-2.41	-Infinity	1.36
$\hat{E}_s/N_{oc}$		dB	8	8	-Infinity	10
SSB_RP	Config 1,2	dBm/SCS	-90	-90	-Infinity	-88
	Config 3		-87	-87	-Infinity	-85
Io Note3	Config 1,2	dBm/ 9.36MHz	-61.41	-57.67	-61.41	-57.67
	Config 3	dBm/ 38.16MHz	-55.31	-51.56	-55.31	-51.56
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 Noc to be fulfilled. Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.						

Same test procedure as described in section 6.3.1.7.5 except:

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;

- $T_{interrupt2} = 2$ slots for test configuration 6.3.1.8-1/2 and $T_{interrupt2} = 3$ slots for test configuration 6.3.1.8-3, is the allowed interruption length during $D_{handover2}$ as in 38.133 [13] clause 6.1.1.2.2;

This gives a total of 10 ms +2 slots for test configuration 6.3.1.8-1/2 and 10 ms + 3 slots for test configuration 6.3.1.8-3.

6.3.1.9 NR SA FR1 Intra-band inter-frequency synchronous DAPS handover

6.3.1.9.1 Test purpose

To verify the requirement for the NR FR1-NR FR1 intra-band inter-frequency DAPS handover requirements in synchronous scenario specified in clause 38.133 [6] clause 6.1.3.2.

6.3.1.9.2 Test applicability

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

6.3.1.9.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.9.

6.3.1.9.4 Test description

6.3.1.9.4.1 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 6.3.1.9.4.1-1.

Table 6.3.1.9.4.1-1: NR SA FR1 Intra-band inter-frequency synchronous DAPS handover test configurations

Config	Description
6.3.1.9-1	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
	Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.3.1.9-2	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
	Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6.3.1.9-3	Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
	Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note:	The UE is only required to be tested in one of the supported test configurations

Configure the test equipment and the DUT according to the parameters in Table 6.3.1.9.4.1-2

Table 6.3.1.9.4.1-2: Initial conditions for NR SA FR1 Intra-band inter-frequency 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, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.	
Channel bandwidth		As specified by the test configuration selected from Table 6.3.1.9.4.1-1	
Propagation conditions		AWGN	As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram		N/A	

1. Message contents are defined in clause 6.3.1.9.4.3.

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 FR1 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 6.3.1.9.4.1-3 below, with A3-Offset modified by Test Tolerance.

Table 6.3.1.9.4.1-3: General test parameters for NR SA FR1 Intra-band inter-frequency synchronous DAPS handover

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
A3-Offset		dB	-3	
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			0 μs	Synchronous cells
T1		s	5	
T2		s	≤5	
T3		s	1	
T4		ms	10 + T$_{interrupt2}$	T$_{interrupt2}$ is defined in TS 38.133 [6] 6.1.3.2.2 Table 6.1.3.2.2-5
T5		ms	100	

6.3.1.9.4.2 Test procedure

The test scenario comprises of two NR carriers and one cell on each carrier, Cell 1 and Cell 2. General parameters and Cell-specific parameters for Cell 1 and Cell 2 are given in Table 6.3.1.9.4.1-3 and 6.3.1.9.5-1 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 may not have any timing information of the Cell 2. Gap pattern ID gp0 is configured as specified in 38.133 [6] Table 9.1.2-1 before T2 in the test case.

From start of T2, the Cell 2 becomes detectable. During T2, the UE performs cell detection and measurements on the Cell 2 and shall send event report to the network. After receiving the event report A3, the network sends a RRC message implying DAPS handover command for target cell addition to the UE.

T3 starts from the instant when 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 reception or UL transmission in the Cell 2 while the DL scheduling and UL feedback in the Cell 1 shall be avoided. 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 last TTI containing DAPS handover command for source cell release sent to the UE. Cell 2 is continuously scheduled in DL during T4.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. And the test system shall observe the periodic reporting of CSI for Cell 1 during T5.

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 6.3.1.9.5-1. 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 A3 triggered measurement reporting on the intra-band 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 6.3.1.9.5-1.

7. UE shall transmit a *MeasurementReport* message triggered by Event A3.

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 shall switch the power settings from T2 to T3 as specified in Table 6.3.1.9.5-1. 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:

   - $D_{handover1}$ = 72 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.

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

14. When T4 expires, T5 starts.

15. If

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

and

d) 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. Cell 1 is the active cell.

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

6.3.1.9.4.3 Message contents

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

Table 6.3.1.9.4.3-1: RRCReconfiguration (Step 4)

Derivation Path: TS 38.508-1 [14], 4.6.1-13 with condition NR_MEAS			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration SEQUENCE {			
measConfig	MeasConfig	Table 6.3.1.9.4.3-3	
nonCriticalExtension SEQUENCE {			
masterCellGroup SEQUENCE {			
spCellConfigDedicated	ServingCellConfig	Table 6.3.1.9.4.3-2	
}			
}			
}			
}			
}			

Table 6.3.1.9.4.3-2: ServingCellConfig (Table 6.3.1.9.4.3-1)

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

Table 6.3.1.9.4.3-3: MeasConfig (Table 6.3.1.9.4.3-1)

Derivation path: Table H.3.1-2 with condition INTER-FREQ			
Information Element	**Value/Remark**	**Comment**	**Condition**
measConfig ::= SEQUENCE {			
reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE {	1 entry		
reportConfig[1] CHOICE {			
reportConfigNR	ReportConfigNR(-3) specified in Table H.3.1-4	Acutal value of A3-threshold is -3 dBm	
}			
}			
}			

Table 6.3.1.9.4.3-4: MeasurementReport (Step 7)

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

Table 6.3.1.9.4.3-5: RRCReconfiguration (Step 8)

Derivation Path: TS 38.508-1 [4], Table 4.8.1-1A with Condition RBConfig_NoKeyChange			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration SEQUENCE {			
radioBearerConfig	RadioBearerConfig	Table 6.3.1.9.4.3-6	
nonCriticalExtension SEQUENCE{			
masterCellGroup	CellGroupConfig	Table 6.3.1.9.4.3-7	
}			
}			
}			
}			

Table 6.3.1.9.4.3-6: RadioBearerConfig (Table 6.3.1.9.4.3-5)

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 6.3.1.9.4.3-7: CellGroupConfig (Table 6.3.1.9.4.3-5)

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

Table 6.3.1.9.4.3-8: RRCReconfiguration (Step 12)

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

6.3.1.9.5   Test requirements

Table 6.3.1.9.5-1 defines the primary level settings including test tolerances for all tests.

Table 6.3.1.9.5-1: Cell specific test parameters for NR SA FR1 Intra-band inter-frequency synchronous DAPS handover

Parameter		Unit	Cell 1		Cell 2	
			T1	T2-T5	T1	T2-T5
NR RF Channel Number			1		2	
Duplex mode	Config 1		FDD			
	Config 2,3		TDD			
TDD configuration	Config 1		Not Applicable			
	Config 2		TDDConf.1.1			
	Config 3		TDDConf.2.1			
BW$_{channel}$	Config 1	MHz	10: $N_{RB,c}$ = 52			
	Config 2		10: $N_{RB,c}$ = 52			
	Config 3		40: $N_{RB,c}$ = 106			
BWP BW	Config 1	MHz	10: $N_{RB,c}$ = 52			
	Config 2		10: $N_{RB,c}$ = 52			
	Config 3		40: $N_{RB,c}$ = 106			
DRX Cycle		ms	Not Applicable			
PDSCH Reference measurement channel	Config 1		SR.1.1 FDD			
	Config 2		SR.1.1 TDD			
	Config 3		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			
TRS configuration	Config 1		TRS.1.1 FDD			
	Config 2		TRS.1.1 TDD			
	Config 3		TRS.1.2 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		5	
	Config 3		10		10	
CSI reporting offset	Config 1,2	slot	3		3	
	Config 3		5		5	
SMTC Configuration			SMTC.1			
SSB Configuration	Config 1,2		SSB.1 FR1			
	Config 3		SSB.2 FR1			
PDSCH/PDCCH subcarrier spacing	Config 1,2	kHz	15 kHz			
	Config 3		30 kHz			
PUCCH/PUSCH subcarrier spacing	Config 1,2	kHz	15 kHz			
	Config 3		30 kHz			
PRACH configuration			FR1 PRACH configuration 1			
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			
EPRE ratio of PBCH DMRS to SSS						

EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
N_{oc} Note2		dBm/15kHz	-98			
N_{oc} Note2	Config 1,2	dBm/SCS	-98			
	Config 3		-95			
$\hat{E}_s / I_{ot}$		dB	8	8	-Infinity	11.7
$\hat{E}_s / N_{oc}$		dB	8	8	-Infinity	11.7
SSB_RP	Config 1,2	dBm/SCS	-90	-90	-Infinity	-86.3
	Config 3	dBm/SCS	-86.99	-86.99	-Infinity	-83.29
Io Note3	Config 1,2	dBm/9.36MHz	-61.41	-61.41	-70.05	-58.06
	Config 3	dBm/38.16MHz	-55.31	-55.31	-63.94	-51.96
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.					

The UE shall start to transmit the PRACH to Cell 2 less than $D_{handover1}$ from the beginning of time period T3. 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 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.

- $T_{processing} = 20$ 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 72 ms.

During T3 UE is allowed to cause $T_{interrupt1}$ interruption to cell 1. $T_{interrupt1}$ is defined in 38.133 [6] clause 6.1.3.2.2 Table 6.1.3.2.2-2. When UE is transmitting PRACH preamble to cell 2, interruption to cell 1 is allowed.

During T4 UE is allowed to cause $T_{interrupt2}$ interruption to cell 1. $T_{interrupt2}$ is defined in 38.133 [6] clause 6.1.3.2.2 Table 6.1.3.2.2-6.

UE shall finish cell 1 release in T4 and shall not send any CSI reports to cell 1 during T5.

6.3.1.10 NR SA FR1 Intra-band inter-frequency asynchronous DAPS handover

6.3.1.10.1 Test purpose

To verify the requirement for the NR FR1-NR FR1 intra-band inter-frequency DAPS handover requirements in asynchronous scenario specified in clause 38.133 [6] clause 6.1.3.2.

6.3.1.10.2 Test applicability

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

6.3.1.10.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.10.

6.3.1.10.4 Test description

6.3.1.10.4.1 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 6.3.1.10.4.1-1.

Table 6.3.1.10.4.1-1: NR SA FR1 Intra-band inter-frequency asynchronous DAPS handover test configurations

Config	Description
6.3.1.10-1	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
	Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
Note:	The UE is only required to be tested in one of the supported test configurations

Configure the test equipment and the DUT according to the parameters in Table 6.3.1.10.4.1-2

Table 6.3.1.10.4.1-2: Initial conditions for NR SA FR1 Intra-band inter-frequency 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, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.3.1.10.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 6.3.1.10.4.3.

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 FR1 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 6.3.1.10.4.1-3 below, with A3-Offset modified by Test Tolerance.

Table 6.3.1.10.4.1-3: General test parameters for NR SA FR1 Intra-band inter-frequency asynchronous DAPS handover

Parameter	Unit	Value	Comment

Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
A3-Offset		dB	-3	
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			10 μs	Asynchronous cells
T1		s	5	
T2		s	≤5	
T3		s	1	
T4		ms	10 + $T_{interrupt2}$	$T_{interrupt2}$ is defined in TS 38.133 [6] 6.1.3.2.2 Table 6.1.3.2.2-5
T5		ms	100	

6.3.1.10.4.2 Test procedure

The test scenario comprises of two NR carriers and one cell on each carrier, Cell 1 and Cell 2. General parameters and Cell-specific parameters for Cell 1 and Cell 2 are given in Table 6.3.1.10.4.1-3 and 6.3.1.10.5-1 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 may not have any timing information of the Cell 2. Gap pattern ID gp0 is configured as specified in 38.133 [6] Table 9.1.2-1 before T2 in the test case.

From start of T2, the Cell 2 becomes detectable. During T2, the UE performs cell detection and measurements on the Cell 2 and shall send event report to the network. After receiving the event report A3, the network sends a RRC message implying DAPS handover command for target cell addition to the UE.

T3 starts from the instant when 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 reception or UL transmission in the Cell 2 while the DL scheduling and UL feedback in the Cell 1 shall be avoided. 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 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. And the test system shall observe the periodic reporting of CSI for cell 1 during T5.

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 6.3.1.10.5-1. 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 A3 triggered measurement reporting on the intra-band 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 6.3.1.10.5-1.

7. UE shall transmit a *MeasurementReport* message triggered by Event A3.

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 shall switch the power settings from T2 to T3 as specified in Table 6.3.1.10.5-1. 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:

    -   $D_{handover1} = 72$ 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.

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

14. When T4 expires, T5 starts.

15. If

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

    and

    f)   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. Cell 1 is the active cell.

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

6.3.1.10.4.3   Message contents

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

Table 6.3.1.10.4.3-1: 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 6.3.1.10.4.3-3	
nonCriticalExtension SEQUENCE {			
masterCellGroup SEQUENCE {			
spCellConfigDedicated	ServingCellConfig	Table 6.3.1.10.4.3-2	
}			
}			
}			
}			
}			

Table 6.3.1.10.4.3-2: ServingCellConfig (Table 6.3.1.10.4.3-1)

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 6.3.1.10.4.3-3: MeasConfig (Table 6.3.1.10.4.3-1)

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(-3) specified in Table H.3.1-4	Acutal value of A3-threshold is -3 dBm	
}			
}			
}			

Table 6.3.1.10.4.3-4: 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 6.3.1.10.4.3-5: 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 6.3.1.10.4.3-6	
nonCriticalExtension SEQUENCE{			
masterCellGroup	CellGroupConfig	Table 6.3.1.10.4.3-7	
}			
}			
}			
}			

Table 6.3.1.10.4.3-6: RadioBearerConfig (Table 6.3.1.10.4.3-5)

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 6.3.1.10.4.3-7: CellGroupConfig (Table 6.3.1.10.4.3-5)

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

Table 6.3.1.10.4.3-8: RRCReconfiguration (Step 12)

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

6.3.1.10.5 Test requirements

Table 6.3.1.10.5-1 defines the primary level settings including test tolerances for all tests.

Table 6.3.1.10.5-1: Cell specific test parameters for NR SA FR1 Intra-band inter-frequency asynchronous DAPS handover

Parameter		Unit	Cell 1		Cell 2	
			T1		T2 -T5	
NR RF Channel Number			1		2	
Duplex mode	Config 1		FDD			
TDD configuration	Config 1		Not Applicable			
BW$_{channel}$	Config 1	MHz	10: N$_{RB,c}$ = 52			
BWP BW	Config 1	MHz	10: N$_{RB,c}$ = 52			
DRX Cycle		ms	Not Applicable			
PDSCH Reference measurement channel	Config 1		SR.1.1 FDD			
CORESET Reference Channel	Config 1		CR.1.1 FDD			
	Config 2		CR.1.1 TDD			
	Config 3		CR.2.1 TDD			
TRS configuration	Config 1		TRS.1.1 FDD			
OCNG Patterns			OP.1			
SMTC Configuration			SMTC.1			
SSB Configuration	Config 1		SSB.1 FR1			
PDSCH/PDCCH subcarrier spacing	Config 1	kHz	15 kHz			
PUCCH/PUSCH subcarrier spacing	Config 1	kHz	15 kHz			
PRACH configuration			FR1 PRACH configuration 1			
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			
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
N_{oc} Note2		dBm/15kHz	-98			
N_{oc} Note2	Config 1	dBm/SCS	-98			
$\hat{E}_s / I_{ot}$		dB	8	8	-Infinity	11.7
$\hat{E}_s / N_{oc}$		dB	8	8	-Infinity	11.7
SSB_RP	Config 1,2	dBm/SCS	-90	-90	-Infinity	-86.3
Io Note3	Config 1,2	dBm/ 9.36MHz	-61.41	-61.41	-70.05	-58.06

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.	

The UE shall start to transmit the PRACH to Cell 2 less than $D_{handover1}$ from the beginning of time period T3. 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 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.

- $T_{processing} = 20$ 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 72 ms.

During T3 UE is allowed to cause $T_{interrupt1}$ interruption to cell 1. $T_{interrupt1}$ is defined in 38.133 [6] clause 6.1.3.2.2 Table 6.1.3.2.2-2. When UE is transmitting PRACH preamble to cell 2, interruption to cell 1 is allowed.

During T4 UE is allowed to cause $T_{interrupt2}$ interruption to cell 1. $T_{interrupt2}$ is defined in 38.133 [6] clause 6.1.3.2.2 Table 6.1.3.2.2-5.

UE shall finish cell 1 release in T4 and shall not send any CSI reports to cell 1 during T5.

6.3.1.11 NR SA FR1 Inter-band inter-frequency synchronous DAPS handover

6.3.1.11.1 Test purpose

To verify the requirement for the NR FR1-NR FR1 inter-band inter-frequency DAPS handover requirements in synchronous scenario specified in clause 38.133 [6] clause 6.1.3.2.

6.3.1.11.2 Test applicability

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

6.3.1.11.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.11.

6.3.1.11.4 Test description

6.3.1.11.4.1 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 6.3.1.11.4.1-1.

Table 6.3.1.11.4.1-1: NR SA FR1 Inter-band inter-frequency synchronous DAPS handover test configurations

Config	Description
6.3.1.11-1	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
	Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.3.1.11-2	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
	Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.3.1.11-3	Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
	Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.3.1.11-4	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
	Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6.3.1.11-5	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
	Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6.3.1.11-6	Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
	Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6.3.1.11-7	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
	Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
6.3.1.11-8	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
	Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
6.3.1.11-9	Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
	Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note:	The UE is only required to be tested in one of the supported test configurations

Configure the test equipment and the DUT according to the parameters in Table 6.3.1.11.4.1-2

Table 6.3.1.11.4.1-2: Initial conditions for NR SA FR1 Inter-band inter-frequency 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, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.3.1.11.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 6.3.1.11.4.3.

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 FR1 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 6.3.1.11.4.1-3 below, with A3-Offset modified by Test Tolerance.

Table 6.3.1.11.4.1-3: General test parameters for NR SA FR1 Inter-band inter-frequency synchronous DAPS handover

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	PCell on RF channel number 1
	Neighbouring cell		Cell 2	Neighbour cell on RF channel number 2
Final condition	Active cell		Cell 2	PCell on RF channel number 2
	Neighbouring cell		Cell 1	Neighbour cell on RF channel number 1
A3-Offset	Config 1,2,4,5,9	dB	-7 (Note 1)	
	Config 3,6	dB	-10 (Note 1)	
	Config 7,8	dB	-4	
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
DRX		OFF	
Measurement gap pattern Id		#0	Gaps are configured before T2.
T1	s	5	
T2	s	<5	
T3	s	<0.5	
T4	ms	10+$T_{interrupt2}$	$T_{interrupt2}$ as defined in TS 38.133 [6] Table 6.1.3.2.2-6 for synchronous DAPS HO
T5	ms	100	
Note 1: Including test tolerance given in Annex F.1.3.2			

6.3.1.11.4.2 Test procedure

The test scenario comprises of two NR bands and one cell on each band, Cell 1 and Cell 2. General parameters and Cell-specific parameters for Cell 1 and Cell 2 are given in Table 6.3.1.11.4.1-3, 6.3.1.11.5-1 and 6.3.1.11.5-2 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. Gap pattern ID gp0 is configured as specified in 38.133 [6] Table 9.1.2-1 before T2 in the test case.

From start of T2, the Cell 2 becomes detectable. During T2, the UE performs cell detection and measurements on the Cell 2 and shall send event report to the network. After receiving the event report A3, the network sends a RRC message implying DAPS handover command for target cell addition to the UE.

T3 starts from the instant when 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 reception or UL transmission in the Cell 2 while the DL scheduling and UL feedback in the Cell 1 shall be avoided. 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 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. And the test system shall observe the periodic reporting of CSI for cell 1 during T5.

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 6.3.1.11.5-1 and Table 6.3.1.11.5-2. 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 A3 triggered measurement reporting on the inter-band 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 6.3.1.11.5-1 and Table 6.3.1.11.5-2.

7. UE shall transmit a *MeasurementReport* message triggered by Event A3.

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 shall switch the power settings from T2 to T3 as specified in Table 6.3.1.11.5-1 and Table 6.3.1.11.5-2. 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:

   - $D_{handover1}$ = 72 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.

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

14. When T4 expires, T5 starts.

15. If

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

   and

   h)   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. Cell 1 is the active cell.

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

6.3.1.11.4.3   Message contents

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

Table 6.3.1.11.4.3-1: 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 6.3.1.11.4.3-3	
nonCriticalExtension SEQUENCE {			
masterCellGroup SEQUENCE {			
spCellConfigDedicated	ServingCellConfig	Table 6.3.1.11.4.3-2	
}			
}			
}			
}			
}			

Table 6.3.1.11.4.3-2: ServingCellConfig (Table 6.3.1.11.4.3-1)

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 6.3.1.11.4.3-3: MeasConfig (Table 6.3.1.11.4.3-1)

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(-7) specified in Table H.3.1-4	Acutal value of a3-Offset is -7 dB	6.3.1.11-1, 6.3.1.11-2, 6.3.1.11-4, 6.3.1.11-5, 6.3.1.11-9.
	ReportConfigNR(-10) specified in Table H.3.1-4	Acutal value of a3-Offset is -10 dB	6.3.1.11-3, 6.3.1.11-6
	ReportConfigNR(-4) specified in Table H.3.1-4	Acutal value of a3-Offset is -4 dB	6.3.1.11-7, 6.3.1.11-8
}			
}			
}			

Table 6.3.1.11.4.3-4: 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 6.3.1.11.4.3-5: 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 6.3.1.11.4.3-6	
nonCriticalExtension SEQUENCE{			
masterCellGroup	CellGroupConfig	Table 6.3.1.11.4.3-7	
}			
}			
}			
}			

Table 6.3.1.11.4.3-6: RadioBearerConfig (Table 6.3.1.11.4.3-5)

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 6.3.1.11.4.3-7: CellGroupConfig (Table 6.3.1.11.4.3-5)

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

Table 6.3.1.11.4.3-8: RRCReconfiguration (Step 12)

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

6.3.1.11.5 Test requirements

Table 6.3.1.11.5-1, Table 6.3.1.11.5-2 defines the primary level settings including test tolerances for all tests.

Table 6.3.1.11.5-1: Cell specific test parameters for NR SA FR1 Inter-band inter-frequency synchronous DAPS handover (Cell 1)

Parameter		Unit	Cell 1	
			T1	T2 – T5
NR RF Channel Number			1	
Duplex mode	Config 1,4,7		FDD	
	Config 2,3,5,6,8,9		TDD	
TDD configuration	Config 1,4,7		Not Applicable	
	Config 2,5,8		TDDConf.1.1	
	Config 3,6,9		TDDConf.2.1	
BW$_{channel}$	Config 1,4,7	MHz	10: N$_{RB,c}$ = 52	
	Config 2,5,8		10: N$_{RB,c}$ = 52	
	Config 3,6,9		40: N$_{RB,c}$ = 106	
BWP BW	Config 1,4,7	MHz	10: N$_{RB,c}$ = 52	
	Config 2,5,8		10: N$_{RB,c}$ = 52	
	Config 3,6,9		40: N$_{RB,c}$ = 106	
TRS configuration	Config 1,4,7		TRS.1.1 FDD	
	Config 2,5,8		TRS.1.1 TDD	
	Config 3,6,9		TRS.1.2 TDD	
DRX Cycle		ms	Not Applicable	
PDSCH Reference measurement channel	Config 1,4,7		SR.1.1 FDD	
	Config 2,5,8		SR.1.1 TDD	
	Config 3,6,9		SR.2.1 TDD	
CORESET Reference Channel	Config 1,4,7		CR.1.1 FDD	
	Config 2,5,8		CR.1.1 TDD	
	Config 3,6,9		CR.2.1 TDD	
OCNG Patterns			OP.1	
CSI-RS configuration for CSI reporting	Config 1,4,7		CSI-RS.1.1 FDD	
	Config 2,5,8		CSI-RS.1.1 TDD	
	Config 3,6,9		CSI-RS.2.1 TDD	
reportConfigType			periodic	
reportQuantity			cri-RI-PMI-CQI	
CSI reporting periodicity	Config 1,2,4,5,7,8	slot	5	
	Config 3,6,9		10	
CSI reporting offset	Config 1,2,4,5,7,8	slot	3	
	Config 3,6,9		5	
SMTC Configuration			SMTC.1	
SSB Configuration	Config 1,2,4,5,7,8		SSB.1 FR1	
	Config 3,6,9		SSB.2 FR1	

Parameter		Unit	Cell 1	
			T1	T2 – T5
PDSCH/PDCCH subcarrier spacing	Config 1,2,4,5,7,8	kHz	15 kHz	
	Config 3,6,9		30 kHz	
PUCCH/PUSCH subcarrier spacing	Config 1,2,4,5,7,8	kHz	15 kHz	
	Config 3,6,9		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	-98	-98
N_{oc} Note2	Config 1,2,4,5,7,8	dBm/SCS	-98	-98
	Config 3,6,9		-95	-95
$\hat{E}_s/I_{ot}$		dB	4	4
$\hat{E}_s/N_{oc}$		dB	4	4
SSB_RP	Config 1,2,4,5,7,8	dBm/SCS	-94	-94
	Config 3,6,9	dBm/SCS	-91	-91
Io Note3	Config 1,2,4,5,7,8	dBm/ 9.36MHz	-64.59	-64.59
	Config 3,6,9	dBm/ 38.16MHz	-58.49	-58.49
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 6.3.1.11.5-2: Cell specific test parameters for NR SA FR1 Inter-band inter-frequency synchronous DAPS handover (Cell 2)

Parameter		Unit	Cell 2	
			T1	T2 - T5
NR RF Channel Number			2	
Duplex mode	Config 1,2,3		FDD	
	Config 4,5,6,7,8,9		TDD	
TDD configuration	Config 1,2,3		Not Applicable	
	Config 4,5,6		TDDConf.1.1	
	Config 7,8,9		TDDConf.2.1	
BW_channel	Config 1,2,3	MHz	10: $N_{RB,c}$ = 52	
	Config 4,5,6		10: $N_{RB,c}$ = 52	
	Config 7,8,9		40: $N_{RB,c}$ = 106	
BWP BW	Config 1,2,3	MHz	10: $N_{RB,c}$ = 52	
	Config 4,5,6		10: $N_{RB,c}$ = 52	
	Config 7,8,9		40: $N_{RB,c}$ = 106	
TRS configuration	Config 1,2,3		TRS.1.1 FDD	
	Config 4,5,6		TRS.1.1 TDD	
	Config 7,8,9		TRS.1.2 TDD	

Parameter		Unit	Cell 2	
			T1	T2 - T5
DRx Cycle		ms	Not Applicable	
PDSCH Reference measurement channel	Config 1,2,3		SR.1.1 FDD	
	Config 4,5,6		SR.1.1 TDD	
	Config 7,8,9		SR2.1 TDD	
CORESET Reference Channel	Config 1,2,3		CR.1.1 FDD	
	Config 4,5,6		CR.1.1 TDD	
	Config 7,8,9		CR2.1 TDD	
OCNG Patterns			OCNG pattern 1	
CSI-RS configuration for CSI reporting	Config 1,4,7		CSI-RS.1.1 FDD	
	Config 2,5,8		CSI-RS.1.1 TDD	
	Config 3,6,9		CSI-RS.2.1 TDD	
SMTC Configuration			SMTC pattern 1	
SSB Configuration	Config 1,2,3,4,5,6		SSB.1 FR1	
	Config 7,8,9		SSB.2 FR1	
PDSCH/PDCCH subcarrier spacing	Config 1,2,3,4,5,6	kHz	15 kHz	
	Config 7,8,9		30 kHz	
PUCCH/PUSCH subcarrier spacing	Config 1,2,3,4,5,6	kHz	15 kHz	
	Config 7,8,9		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	-98	-98
N_{oc} [Note2]	Config 1,2,3,4,5,6	dBm/SCS	-98	-98
	Config 7,8,9		-95	-95
$\hat{E}_s/I_{ot}$		dB	-Infinity	4
$\hat{E}_s/N_{oc}$		dB	-Infinity	4
SSB_RP	Config 1,2,3,4,5,6	dBm/SCS	-Infinity	-94
	Config 7,8,9	dBm/SCS	-Infinity	-91
Io [Note3]	Config 1,2,3,4,5,6	dBm/ 9.36MHz	-70.05	-64.59
	Config 7,8,9	dBm/ 38.16MHz	-63.94	-58.49
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.				

The UE shall start to transmit the PRACH to Cell 2 less than D$_{handover1}$ from the beginning of time period T3. 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 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.

- $T_{processing}$ = 20 ms, is the time for UE processing specified in 38.133 [6] clause 6.1.1.2.2.

- T_{Δ} = 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 72 ms.

The UE shall complete to release Cell 1 less than (10 ms + $T_{interrupt2}$) from the beginning of time period T4. During $D_{handover2}$, the interruption on Cell 2 shall not exceed $T_{interrupt2}$ as defined in TS 38.133 [6] Table 6.1.3.2.2-6 for synchronous DAPS HO.

The handover delay $D_{handover2}$ can be expressed as: $T_{RRC\_procedure} + T_{interrupt2}$, where:

$T_{RRC\_procedure}$ = 10 ms and is specified in clause 12 in TS 38.331 [13].

6.3.1.12 NR SA FR1 Inter-band inter-frequency asynchronous DAPS handover

6.3.1.12.1 Test purpose

To verify the requirement for the NR FR1-NR FR1 inter-band inter-frequency DAPS handover requirements in asynchronous scenario specified in clause 38.133 [6] clause 6.1.3.2.

6.3.1.12.2 Test applicability

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

6.3.1.12.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.1.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.1.12.

6.3.1.12.4 Test description

6.3.1.12.4.1 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 6.3.1.12.4.1-1.

Table 6.3.1.12.4.1-1: NR SA FR1 Inter-band inter-frequency asynchronous DAPS handover test configurations

Config	Description
6.3.1.12-1	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.3.1.12-2	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.3.1.12-3	Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.3.1.12-4	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6.3.1.12-5	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6.3.1.12-6	Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6.3.1.12-7	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
6.3.1.12-8	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode

Config	Description
6.3.1.12-9	Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
	Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note:	The UE is only required to be tested in one of the supported test configurations

Configure the test equipment and the DUT according to the parameters in Table 6.3.1.12.4.1-2

Table 6.3.1.12.4.1-2: Initial conditions for NR SA FR1 Inter-band inter-frequency 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, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.3.1.12.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 6.3.1.12.4.3.

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 FR1 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 6.3.1.12.4.1-3 below, with A3-Offset modified by Test Tolerance.

Table 6.3.1.12.4.1-3: General test parameters for NR SA FR1 Inter-band inter-frequency asynchronous DAPS handover

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
A3-Offset	Config 1,2,4,5,9	dB	-7(Note 1)	
	Config 3,6	dB	-10(Note 1)	
	Config 7,8	dB	-4	
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	Config 1,2,4,5	ms	0.5	Asynchronous cells
	Config3,6,7,8,9	ms	0.25	
DRX			OFF	
Measurement gap pattern Id			#0	Gaps are configured before T2.
T1		s	5	
T2		s	<5	
T3		s	<0.5	
T4		ms	10+$T_{interrupt2}$	$T_{interrupt2}$ as defined in TS 38.133 [6] Table 6.1.3.2.2-6 for asynchronous DAPS HO.
T5		ms	100	
Note 1: Including test tolerance given in Annex F.1.3.2				

6.3.1.12.4.2 Test procedure

The test scenario comprises of two NR bands and one cell on each band, Cell 1 and Cell 2. General parameters and Cell-specific parameters for Cell 1 and Cell 2 are given in Table 6.3.1.12.4.1-3, 6.3.1.12.5-1 and 6.3.1.12.5-2 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. Gap pattern ID gp0 is configured as specified in 38.133 [6] Table 9.1.2-1 before T2 in the test case.

From start of T2, the Cell 2 becomes detectable. During T2, the UE performs cell detection and measurements on the Cell 2 and shall send event report to the network. After receiving the event report A3, the network sends a RRC message implying DAPS handover command for target cell addition to the UE.

T3 starts from the instant when 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 reception or UL transmission in the Cell 2 while the DL scheduling and UL feedback in the Cell 1 shall be avoided. 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 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. And the test system shall observe the periodic reporting of CSI for cell 1 during T5.

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 6.3.1.12.5-1 and Table 6.3.1.12.5-2. 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 A3 triggered measurement reporting on the inter-band 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 6.3.1.12.5-1 and Table 6.3.1.12.5-2.

7. UE shall transmit a *MeasurementReport* message triggered by Event A3.

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 shall switch the power settings from T2 to T3 as specified in Table 6.3.1.12.5-1 and Table 6.3.1.12.5-2. 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:

   - $D_{handover1} = 72$ 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.

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

14. When T4 expires, T5 starts.

15. If

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

and

j)   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. Cell 1 is the active cell.

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

6.3.1.12.4.3   Message contents

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

Table 6.3.1.12.4.3-1: RRCReconfiguration (Step 4)

Derivation Path: TS 38.508-1 [14], 4.6.1-13 with condition NR_MEAS			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration SEQUENCE {			
measConfig	MeasConfig	Table 6.3.1.12.4.3-3	
nonCriticalExtension SEQUENCE {			
masterCellGroup SEQUENCE {			
spCellConfigDedicated	ServingCellConfig	Table 6.3.1.12.4.3-2	
}			
}			
}			
}			
}			

Table 6.3.1.12.4.3-2: ServingCellConfig (Table 6.3.1.12.4.3-1)

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

Table 6.3.1.12.4.3-3: MeasConfig (Table 6.3.1.12.4.3-1)

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(-7) specified in Table H.3.1-4	Acutal value of a3-Offset is -7 dB	6.3.1.11-1, 6.3.1.11-2, 6.3.1.11-4, 6.3.1.11-5, 6.3.1.11-9.
	ReportConfigNR(-10) specified in Table H.3.1-4	Acutal value of a3-Offset is -10 dB	6.3.1.11-3, 6.3.1.11-6
	ReportConfigNR(-4) specified in Table H.3.1-4	Acutal value of a3-Offset is -4 dB	6.3.1.11-7, 6.3.1.11-8
}			
}			
}			

Table 6.3.1.12.4.3-4: 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 6.3.1.12.4.3-5: 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 6.3.1.12.4.3-6	
nonCriticalExtension SEQUENCE{			
masterCellGroup	CellGroupConfig	Table 6.3.1.12.4.3-7	
}			
}			
}			
}			

Table 6.3.1.12.4.3-6: RadioBearerConfig (Table 6.3.1.12.4.3-5)

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 6.3.1.12.4.3-7: CellGroupConfig (Table 6.3.1.12.4.3-5)

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

Table 6.3.1.12.4.3-8: RRCReconfiguration (Step 12)

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

6.3.1.12.5   Test requirements

Table 6.3.1.12.5-1, Table 6.3.1.12.5-2 defines the primary level settings including test tolerances for all tests.

Table 6.3.1.12.5-1: Cell specific test parameters for NR SA FR1 Inter-band inter-frequency asynchronous DAPS handover (Cell 1)

Parameter		Unit	Cell 1	
			T1	T2 – T5
NR RF Channel Number			1	
Duplex mode	Config 1,4,7		FDD	
	Config 2,3,5,6,8,9		TDD	
TDD configuration	Config 1,4,7		Not Applicable	
	Config 2,5,8		TDDConf.1.1	
	Config 3,6,9		TDDConf.2.1	
BW$_{channel}$	Config 1,4,7	MHz	10: $N_{RB,c}$ = 52	
	Config 2,5,8		10: $N_{RB,c}$ = 52	
	Config 3,6,9		40: $N_{RB,c}$ = 106	
BWP BW	Config 1,4,7	MHz	10: $N_{RB,c}$ = 52	
	Config 2,5,8		10: $N_{RB,c}$ = 52	
	Config 3,6,9		40: $N_{RB,c}$ = 106	
TRS configuration	Config 1,4,7		TRS.1.1 FDD	
	Config 2,5,8		TRS.1.1 TDD	

Parameter		Unit	Cell 1	
			T1	T2 – T5
	Config 3,6,9		TRS.1.2 TDD	
DRX Cycle		ms	Not Applicable	
PDSCH Reference measurement channel	Config 1,4,7		SR.1.1 FDD	
	Config 2,5,8		SR.1.1 TDD	
	Config 3,6,9		SR.2.1 TDD	
CORESET Reference Channel	Config 1,4,7		CR.1.1 FDD	
	Config 2,5,8		CR.1.1 TDD	
	Config 3,6,9		CR.2.1 TDD	
OCNG Patterns			OP.1	
CSI-RS configuration for CSI reporting	Config 1,4,7		CSI-RS.1.1 FDD	
	Config 2,5,8		CSI-RS.1.1 TDD	
	Config 3,6,9		CSI-RS.2.1 TDD	
reportConfigType			periodic	
reportQuantity			cri-RI-PMI-CQI	
CSI reporting periodicity	Config 1,2,4,5,7,8	slot	5	
	Config 3,6,9		10	
CSI reporting offset	Config 1,2,4,5,7,8	slot	3	
	Config 3,6,9		5	
SMTC Configuration			SMTC.1	
SSB Configuration	Config 1,2,4,5,7,8		SSB.1 FR1	
	Config 3,6,9		SSB.2 FR1	
PDSCH/PDCCH subcarrier spacing	Config 1,2,4,5,7,8	kHz	15 kHz	
	Config 3,6,9		30 kHz	
PUCCH/PUSCH subcarrier spacing	Config 1,2,4,5,7,8	kHz	15 kHz	
	Config 3,6,9		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	-98	-98
N_{oc} [Note2]	Config 1,2,4,5,7,8	dBm/SCS	-98	-98
	Config 3,6,9		-95	-95
$\hat{E}_s/I_{ot}$		dB	4	4
$\hat{E}_s/N_{oc}$		dB	4	4
SSB_RP	Config 1,2,4,5,7,8	dBm/SCS	-94	-94
	Config 3,6,9	dBm/SCS	-91	-91
Io [Note3]	Config 1,2,4,5,7,8	dBm/ 9.36MHz	-64.59	-64.59
	Config 3,6,9	dBm/ 38.16MHz	-58.49	-58.49
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 6.3.1.12.5-2: Cell specific test parameters for NR SA FR1 Inter-band inter-frequency asynchronous DAPS handover (Cell 2)

Parameter		Unit	Cell 2	
			T1	T2 - T5
NR RF Channel Number			2	
Duplex mode	Config 1,2,3		FDD	
	Config 4,5,6,7,8,9		TDD	
TDD configuration	Config 1,2,3		Not Applicable	
	Config 4,5,6		TDDConf.1.1	
	Config 7,8,9		TDDConf.2.1	
BW$_{channel}$	Config 1,2,3	MHz	10: $N_{RB,c}$ = 52	
	Config 4,5,6		10: $N_{RB,c}$ = 52	
	Config 7,8,9		40: $N_{RB,c}$ = 106	
BWP BW	Config 1,2,3	MHz	10: $N_{RB,c}$ = 52	
	Config 4,5,6		10: $N_{RB,c}$ = 52	
	Config 7,8,9		40: $N_{RB,c}$ = 106	
TRS configuration	Config 1,2,3		TRS.1.1 FDD	
	Config 4,5,6		TRS.1.1 TDD	
	Config 7,8,9		TRS.1.2 TDD	
DRx Cycle		ms	Not Applicable	
PDSCH Reference measurement channel	Config 1,2,3		SR.1.1 FDD	
	Config 4,5,6		SR.1.1 TDD	
	Config 7,8,9		SR2.1 TDD	
CORESET Reference Channel	Config 1,2,3		CR.1.1 FDD	
	Config 4,5,6		CR.1.1 TDD	
	Config 7,8,9		CR2.1 TDD	
OCNG Patterns			OCNG pattern 1	
CSI-RS configuration for CSI reporting	Config 1,4,7		CSI-RS.1.1 FDD	
	Config 2,5,8		CSI-RS.1.1 TDD	
	Config 3,6,9		CSI-RS.2.1 TDD	
SMTC Configuration			SMTC pattern 1	
SSB Configuration	Config 1,2,3,4,5,6		SSB.1 FR1	
	Config 7,8,9		SSB.2 FR1	
PDSCH/PDCCH subcarrier spacing	Config 1,2,3,4,5,6	kHz	15 kHz	
	Config 7,8,9		30 kHz	
PUCCH/PUSCH subcarrier spacing	Config 1,2,3,4,5,6	kHz	15 kHz	
	Config 7,8,9		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	-98	-98
N_{oc} [Note2]	Config 1,2,3,4,5,6	dBm/SCS	-98	-98
	Config 7,8,9		-95	-95
$\hat{E}_s / I_{ot}$		dB	-Infinity	4
$\hat{E}_s / N_{oc}$		dB	-Infinity	4
SSB_RP	Config 1,2,3,4,5,6	dBm/SCS	-Infinity	-94
	Config 7,8,9	dBm/SCS	-Infinity	-91
Io [Note3]	Config 1,2,3,4,5,6	dBm/ 9.36MHz	-70.05	-64.59

Parameter		Unit	Cell 2	
			T1	T2 - T5
	Config 7,8,9	dBm/ 38.16MHz	-63.94	-58.49
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.				

The UE shall start to transmit the PRACH to Cell 2 less than $D_{handover1}$ from the beginning of time period T3. 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 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.

- $T_{processing} = 20$ 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 72 ms.

The UE shall complete to release Cell 1 less than (10 ms + $T_{interrupt2}$) from the beginning of time period T4. During $D_{handover2}$, the interruption on Cell 2 shall not exceed $T_{interrupt2}$ as defined in TS 38.133 [6] Table 6.1.3.2.2-6 for asynchronous DAPS HO.

The handover delay $D_{handover2}$ can be expressed as: $T_{RRC\_procedure} + T_{interrupt2}$, where:

$T_{RRC\_procedure} = 10$ ms and is specified in clause 12 in TS 38.331 [13].

6.3.2 RRC connection mobility control

6.3.2.1 RRC re-establishment

6.3.2.1.0 Minimum conformance requirements

6.3.2.1.0.1 Minimum conformance requirements for FR1 RRC re-establishment

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:

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

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

The UE re-establishment delay ($T_{UE\_re\text{-}establish\_delay}$) 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:

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

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 fullfilled.

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 fullfilled.

$T_{identify\_intra\_NR}$: 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 6.3.2.1.0.1-1.

$T_{identify\_inter\_NR,i}$: 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 6.3.2.1.0.1-2.

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-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.

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

Table 6.3.2.1.0.1-1: 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 6.3.2.1.0.1-2: Time to identify target NR cell for RRC connection re-establishment to NR inter-frequency cell

		$T_{identify\_inter\_NR, i}$ (ms)

Serving cell SSB Ês/Iot (dB)	Frequency range (FR) of target NR cell	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] clauses 6.2.1.2.1.

6.3.2.1.1 NR SA FR1 RRC re-establishment

6.3.2.1.1.1 Test purpose

The purpose is to verify that the NR intra-frequency RRC re-establishment delay in FR1 with known target cell is within the specified limits.

6.3.2.1.1.2 Test applicability

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

6.3.2.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.2.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.2.1.1.

6.3.2.1.1.4 Test description

6.3.2.1.1.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 6.3.2.1.1.4.1-1

Table 6.3.2.1.1.4.1-1: Supported test configurations

Configuration	Description
6.3.2.1.1-1	15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
6.3.2.1.1-2	15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
6.3.2.1.1-3	30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note:	The UE is only required to be tested in one of the supported test configurations.

Configure the test requirement and the DUT according to the parameters in Table 6.3.2.1.1.4.1-2

Table 6.3.2.1.1.4.1-2: Initial conditions for NR Intra-frequency RRC Re-establishment in FR1

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.3.2.1.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part		

1. The general test parameter settings are set up according to Table 6.3.2.1.1.4.1-3.

2. Message contents are defined in clause 6.3.2.1.1.4.3.

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 6.3.2.1.1.4.1-3: General test parameters for NR intra-frequency RRC Re-establishment test case in FR1

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3	Cell1	
	Neighbour cells		1, 2, 3	Cell2	
Final condition	Active cell		1, 2, 3	Cell2	
RF Channel Number			1, 2, 3	1	
Time offset between cells			1	3 ms	Asynchronous cells
			2	3 μs	Synchronous cells
			3	3 μs	Synchronous cells
N310		-	1, 2, 3	1	Maximum consecutive out-of-sync indications from lower layers
N311		-	1, 2, 3	1	Minimum consecutive in-sync indications from lower layers
T310		ms	1, 2, 3	0	Radio link failure timer
T311		ms	1, 2, 3	3000	RRC re-establishment timer
Access Barring Information		-	1, 2, 3	Not Sent	No additional delays in random access procedure.
SSB configuration			1	SSB.1 FR1	
			2	SSB.1 FR1	
			3	SSB.2 FR1	
SMTC configuration			1	SMTC.2	
			2	SMTC.1	
			3	SMTC.1	
DRX cycle length		s	1, 2, 3	OFF	
PRACH configuration			1, 2, 3	PRACH.1 FR1	Table A.7.1-1
T1		s	1, 2, 3	5	
T2		ms	1, 2, 3	240	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, 2, 3	2	

6.3.2.1.1.4.2 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, is deactivated. 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. Establish SRB2 and DRB in the RRC Reconfiguration message.

2. Set the parameters according to T1 in Table 6.3.2.1.1.5-1. 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 6.3.2.1.1.5-1. T2 starts

6. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 6.3.2.1.1.5-1. T3 starts

7. If the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2 within 1.6 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. Repeat step 2-8 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

6.3.2.1.1.4.3   Message contents

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

Table 6.3.2.1.1.4.3-1: Common Exception messages intra-frequency RRC re-establishment

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	
Specific message contents exceptions for Test Configuration 6.3.2.1.1-1	Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2
Specific message contents exceptions for Test Configuration 6.3.2.1.1-2	Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1 and synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1
Specific message contents exceptions for Test Configuration 6.3.2.1.1-3	Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.2 FR1 and synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 6.3.2.1.1.4.3-2: *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	ms3000		
}			

Table 6.3.2.1.1.4.3-3: *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		
}			

6.3.2.1.1.5   Test requirement

Table 6.3.2.1.1.5-1 defines the primary level settings including test tolerances for NR Intra-frequency RRC Re-establishment in FR1 test case.

Table 6.3.2.1.1.5-1: Cell specific test parameters for NR intra-frequency RRC Re-establishment test case in FR1

Parameter	Unit	Test configuration	Cell 1			Cell 2		
			T1	**T2**	**T3**	**T1**	**T2**	**T3**
TDD configuration		1	N/A			N/A		
		2	TDDConf.1.1			TDDConf.1.1		
		3	TDDConf.2.1			TDDConf.2.1		
PDSCH RMC configuration		1	SR.1.1 FDD			SR.1.1 FDD		
		2	SR.1.1 TDD			SR.1.1 FDD		

Parameter	Unit	Test configuration	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
		3	SR.2.1 TDD			SR.2.1 FDD		
RMSI CORESET RMC configuration		1	CR.1.1 FDD			CR.1.1 FDD		
		2	CR.1.1 TDD			CR.1.1 TDD		
		3	CR.2.1 TDD			CR.2.1 TDD		
Dedicated CORESET RMC configuration		1	CCR.1.1 FDD			CCR.1.1 FDD		
		2	CCR.1.1 TDD			CCR.1.1 TDD		
		3	CCR.2.1 TDD			CCR.2.1 TDD		
OCNG Pattern		1, 2, 3	OP.1 defined in A.3.2.1			OP.1 defined in A.3.2.1		
TRS configuration		1	TRS.1.1 FDD			TRS.1.1 FDD		
		2	TRS.1.1 TDD			TRS.1.1 TDD		
		3	TRS.1.2 TDD			TRS.1.2 TDD		
Initial DL BWP configuration		1, 2, 3	DLBWP.0.1			DLBWP.0.1		
Initial UL BWP configuration		1, 2, 3	ULBWP.0.1			ULBWP.0.1		
Active DL BWP configuration		1, 2, 3	DLBWP.1.1	N/A	N/A	N/A	N/A	DLBWP.1.1
Active UL BWP configuration		1, 2, 3	ULBWP.1.1	N/A	N/A	N/A	N/A	ULBWP.1.1
RLM-RS		1, 2, 3	SSB			SSB		
$\hat{E}_s / I_{ot}$	dB	1	1.54	-infinity	-infinity	-3.79	4	4
		2						
		3						
N_{oc} Note2	dBm/SCS	1	-98					
		2	-98					
		3	-95					
N_{oc} Note2	dBm/15 kHz	1	-98					
		2						
		3						
$\hat{E}_s / N_{oc}$	dB	1	7	-infinity	-infinity	4	4	4
		2						
		3						
SS-RSRP Note3	dBm/SCS	1	-91	-infinity	-infinity	-94	-94	-94
		2	-91	-infinity	-infinity	-94	-94	-94
		3	-88	-infinity	-infinity	-91	-91	-91
Io	dBm/9.36 MHz	1	-60.74	-64.59	-64.59	-60.74	-64.59	-64.59
	dBm/9.36 MHz	2	-60.74	-64.59	-64.59	-60.74	-64.59	-64.59
	dBm/38.16 MHz	3	-54.65	-58.50	-58.50	-54.65	-58.50	-58.50
Propagation Condition		1, 2, 3	AWGN					
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.								
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.								
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.								

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to a known NR intra frequency cell shall be less than 1.6 s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

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

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.

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

$N_{freq} = 1$

$T_{identify\_intra\_NR} = 200$ ms

$T_{SI} = 1280$ ms; it is the time required for receiving all the relevant system information as defined in TS 38.331 for the target intra-frequency NR cell.

$T_{PRACH} = 15$ ms; it is the additional delay caused by the random access procedure.

This gives a total of 1545 ms, allow 1.6 s in the test case.

6.3.2.1.2 NR SA FR1 - FR1 RRC re-establishment

6.3.2.1.2.1 Test purpose

The purpose is to verify that the NR inter-frequency RRC re-establishment delay in FR1 without known target cell is within the specified limits.

6.3.2.1.2.2 Test applicability

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

6.3.2.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.2.1.0.1.

The normative reference for this requirement is TS 38.133 [6] A.6.3.2.1.2.

6.3.2.1.2.4 Test description

6.3.2.1.2.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 6.3.2.1.2.4.1-1

Table 6.3.2.1.2.4.1-1: Supported test configurations

Configuration	Description of serving cell	Description of target cell
6.3.2.1.2-1	15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode	15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
6.3.2.1.2-2	15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode	15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
6.3.2.1.2-3	30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode	30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note: The UE is only required to be tested in one of the supported test configurations.		

Configure the test requirement and the DUT according to the parameters in Table 6.3.2.1.2.4.1-2

Table 6.3.2.1.2.4.1-2: Initial conditions for NR Inter-frequency RRC Re-establishment in FR1

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.3.2.1.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	Without LTE link - For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part		

1. The general test parameter settings are set up according to Table 6.3.2.1.2.4.1-3.

2. Message contents are defined in clause 6.3.2.1.2.4.3.

There are two NR carriers 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 6.3.2.1.2.4.1-3: General test parameters for NR inter-frequency RRC Re-establishment test case in FR1

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3	Cell1	
	Neighbour cells		1, 2, 3	Cell2	
Final condition	Active cell		1, 2, 3	Cell2	
RF Channel Number			1, 2, 3	1, 2	
Time offset between cells			1	3 ms	Asynchronous cells
			2	3 μs	Synchronous cells
			3	3 μs	Synchronous cells
N310		-	1, 2, 3	1	Maximum consecutive out-of-sync indications from lower layers
N311		-	1, 2, 3	1	Minimum consecutive in-sync indications from lower layers
T310		ms	1, 2, 3	0	Radio link failure timer
T311		ms	1, 2, 3	5000	RRC re-establishment timer
Access Barring Information		-	1, 2, 3	Not Sent	No additional delays in random access procedure.
SSB configuration			1	SSB.1 FR1	
			2	SSB.1 FR1	
			3	SSB.2 FR1	
SMTC configuration			1	SMTC.2	
			2	SMTC.1	
			3	SMTC.1	
DRX cycle length		s	1, 2, 3	OFF	
PRACH configuration			1, 2, 3	PRACH.1 FR1	Table A.7.1-1
T1		s	1, 2, 3	5	
T2		ms	1, 2, 3	240	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, 2, 3	5	

6.3.2.1.2.4.2 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 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. Establish SRB2 and DRB in the RRC Reconfiguration message.

2. Set the parameters according to T1 in Table 6.3.2.1.2.5-1. 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 6.3.2.1.2.5-1. T2 starts

6. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 6.3.2.1.2.5-1. T3 starts

7. If the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2 within 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 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.

6.3.2.1.2.4.3 Message contents

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

Table 6.3.2.1.2.4.3-1: Common Exception messages inter-frequency RRC re-establishment

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	
Specific message contents exceptions for Test Configuration 6.3.2.1.2-1	Table H.3.1-3 with Condition INTER-FREQ MO, SSB.1 FR1 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2
Specific message contents exceptions for Test Configuration 6.3.2.1.2-2	Table H.3.1-3 with Condition INTER-FREQ MO, SSB.1 FR1 and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1
Specific message contents exceptions for Test Configuration 6.3.2.1.2-3	Table H.3.1-3 with Condition INTER-FREQ MO, SSB.2 FR1 and Synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 6.3.2.1.2.4.3-2: *RLF-TimersAndConstants* for inter-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 6.3.2.1.2.4.3-3: *MeasConfig* for inter-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		
}			

6.3.2.1.2.5 Test requirement

Table 6.3.2.1.2.5-1 defines the primary level settings including test tolerances for NR Inter-frequency RRC Re-establishment in FR1 test case.

Table 6.3.2.1.2.5-1: Cell specific test parameters for NR inter-frequency RRC Re-establishment test case in FR1

Parameter	Unit	Test configuration	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
RF Channel Number		1, 2, 3	1			2		
TDD configuration		1	N/A			N/A		
		2	TDDConf.1.1			TDDConf.1.1		
		3	TDDConf.2.1			TDDConf.2.1		
PDSCH RMC configuration		1	SR.1.1 FDD			SR.1.1 FDD		
		2	SR.1.1 TDD			SR.1.1 TDD		
		3	SR.2.1 TDD			SR.2.1 TDD		
RMSI CORESET RMC configuration		1	CR.1.1 FDD			CR.1.1 FDD		
		2	CR.1.1 TDD			CR.1.1 TDD		
		3	CR.2.1 TDD			CR.2.1 TDD		
Dedicated CORESET RMC configuration		1	CCR.1.1 FDD			CCR.1.1 FDD		
		2	CCR.1.1 TDD			CCR.1.1 TDD		
		3	CCR.2.1 TDD			CCR.2.1 TDD		
OCNG Pattern		1, 2, 3	OP.1 defined in A.3.2.1			OP.1 defined in A.3.2.1		
TRS configuration		1	TRS.1.1 FDD			TRS.1.1 FDD		
		2	TRS.1.1 TDD			TRS.1.1 TDD		
		3	TRS.1.2 TDD			TRS.1.2 TDD		
Initial DL BWP configuration		1, 2, 3	DLBWP.0.1			DLBWP.0.1		
Initial UL BWP configuration		1, 2, 3	ULBWP.0.1			ULBWP.0.1		
Active DL BWP configuration		1, 2, 3	DLBWP. 1.1	N/A	N/A	N/A	N/A	DLBW P.1.1
Active UL BWP configuration		1, 2, 3	ULBWP. 1.1	N/A	N/A	N/A	N/A	ULBW P.1.1
RLM-RS		1, 2, 3	SSB			SSB		
$\hat{E}_s/I_{ot}$	dB	1	4	-infinity	-infinity	-infinity	-infinity	7
		2						
		3						
N_{oc} Note2	dBm/SCS	1	-98					
		2	-98					
		3	-95					
N_{oc} Note2	dBm/15 kHz	1	-98					
		2						
		3						
$\hat{E}_s/N_{oc}$	dB	1	4	-infinity	-infinity	-infinity	-infinity	7
		2						
		3						
SS-RSRP Note3	dBm/SCS	1	-94	-infinity	-infinity	-infinity	-infinity	-91
		2	-94	-infinity	-infinity	-infinity	-infinity	-91
		3	-91	-infinity	-infinity	-infinity	-infinity	-88
Io	dBm/9.36 MHz	1	-64.59	-70.05	-70.05	-70.05	-70.05	-62.26
	dBm/9.36 MHz	2	-64.59	-70.05	-70.05	-70.05	-70.05	-62.26
	dBm/38.16 MHz	3	-58.50	-63.94	-63.94	-63.94	-63.94	-56.15
Propagation Condition		1, 2, 3	AWGN					
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.								
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.								
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.								

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to an unknown NR inter frequency cell shall be less than 3 s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

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

Where:

T_{UL_grant} = It is the time required to acquire and process uplink grant from the target cell. The PRACH reception at the system simulator is used as a trigger for the completion of the test; hence T_{UL_grant} is not used.

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

$N_{freq} = 2$

$T_{identify\_intra\_NR} = 800$ ms

$T_{identify\_inter\_NR} = 800$ 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 inter-frequency NR cell.

$T_{PRACH} = 15$ ms; it is the additional delay caused by the random access procedure.

This gives a total of 2945 ms, allow 3 s in the test case.

6.3.2.1.3 NR SA FR1 RRC re-establishment without serving cell timing

6.3.2.1.3.1 Test purpose

The purpose is to verify that the NR intra-frequency RRC re-establishment delay in FR1 without serving cell timing is within the specified limits and to verify the requirements in TS 38.133 [6] clause 6.2.1

6.3.2.1.3.2 Test applicability

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

6.3.2.1.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.2.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.2.1.3.

6.3.2.1.3.4 Test description

6.3.2.1.3.4.1 Initial conditions

The test shall be tested using any of the test configuration in Table 6.3.2.1.3.4.1-1

Table 6.3.2.1.3.4.1-1: Supported test configurations

Configuration	Description
6.3.2.1.3-1	15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
6.3.2.1.3-2	15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
6.3.2.1.3-3	30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note:	The UE is only required to be tested in one of the supported test configurations.

Configure the test requirement and the DUT according to the parameters in Table 6.3.2.1.3.4.1-2

Table 6.3.2.1.3.4.1-2: Initial conditions for NR SA FR1 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.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.3.2.1.3.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	

| Exceptions to connection diagram | - Without LTE link
- For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part | |

1.   The general test parameter settings are set up according to Table 6.3.2.1.3.4.1-3.

2.   Message contents are defined in clause 6.3.2.1.3.4.3.

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.1.2 and C.1.3 for this test.

Table 6.3.2.1.3.4.1-3: General test parameters for NR SA FR1 RRC re-establishment without serving cell timing

Parameter		Unit	Test configuration	Value	Comment
Initial condition	Active cell		1, 2, 3	Cell1	
	Neighbour cells		1, 2, 3	Cell2	
Final condition	Active cell		1, 2, 3	Cell2	
RF Channel Number			1, 2, 3	1	
Time offset between cells			1	3 ms	Asynchronous cells
			2	3 μs	Synchronous cells
			3	3 μs	Synchronous cells
N310		-	1, 2, 3	1	Maximum consecutive out-of-sync indications from lower layers
N311		-	1, 2, 3	1	Minimum consecutive in-sync indications from lower layers
T310		ms	1, 2, 3	6000	Radio link failure timer configured by *RLF-TimersAndConstants*
T311		ms	1, 2, 3	3000	RRC re-establishment timer
Access Barring Information		-	1, 2, 3	Not Sent	No additional delays in random access procedure.
SSB configuration			1	SSB.1 FR1	
			2	SSB.1 FR1	
			3	SSB.2 FR1	
SMTC configuration			1	SMTC.2	
			2	SMTC.1	
			3	SMTC.1	
DRX cycle length		s	1, 2, 3	OFF	
PRACH configuration			1, 2, 3	PRACH.1 FR1	
T1		s	1, 2, 3	5	
T2		s	1, 2, 3	6.24	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, 2, 3	3	

6.3.2.1.3.4.2   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, is deactivated. 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. Establish SRB2 and DRB in the RRC Reconfiguration message.

2.   Set the parameters according to T1 in Table 6.3.2.1.3.5-1. 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 6.3.2.1.3.5-1. T2 starts

6. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 6.3.2.1.3.5-1. T3 starts

7. If the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2 within 2.2 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, 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.

6.3.2.1.3.4.3   Message contents

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

Table 6.3.2.1.3.4.3-1: Common Exception messages for NR SA FR1 RRC re-establishment without serving cell timing

Default Message Contents	
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	
Specific message contents exceptions for Test Configuration 6.3.2.1.3-1	Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.2
Specific message contents exceptions for Test Configuration 6.3.2.1.3-2	Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.1 FR1 and synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1
Specific message contents exceptions for Test Configuration 6.3.2.1.3-3	Table H.3.1-3 with Condition INTRA-FREQ MO, SSB.2 FR1 and synchronous cells Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1

Table 6.3.2.1.3.4.3-2: *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	ms6000		
t311	ms3000		
}			

Table 6.3.2.1.3.4.3-3: *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		
}			

6.3.2.1.3.5   Test requirement

Table 6.3.2.1.3.5-1 defines the primary level settings including test tolerances for NR SA FR1 RRC re-establishment without serving cell timing test case.

Table 6.3.2.1.3.5-1: Cell specific test parameters for NR SA FR1 RRC re-establishment without serving cell timing

Parameter	Unit	Test configuration	Cell 1			Cell 2		
			T1	T2	T3	T1	T2	T3
TDD configuration		1	N/A			N/A		
		2	TDDConf.1.1			TDDConf.1.1		
		3	TDDConf.2.1			TDDConf.2.1		
PDSCH RMC configuration		1	SR.1.1 FDD			SR.1.1 FDD		
		2	SR.1.1 TDD			SR.1.1 TDD		
		3	SR.2.1 TDD			SR.2.1 TDD		
RMSI CORESET RMC configuration		1	CR.1.1 FDD			CR.1.1 FDD		
		2	CR.1.1 TDD			CR.1.1 TDD		
		3	CR.2.1 TDD			CR.2.1 TDD		
Dedicated CORESET RMC configuration		1	CCR.1.1 FDD			CCR.1.1 FDD		
		2	CCR.1.1 TDD			CCR.1.1 TDD		
		3	CCR.2.1 TDD			CCR.2.1 TDD		
OCNG Pattern		1, 2, 3	OP.1			OP.1		
TRS Configuration		1	TRS.1.1.FDD			TRS.1.1.FDD		
		2	TRS.1.1.TDD			TRS.1.1.TDD		
		3	TRS.1.2.FDD			TRS.1.2.TDD		
Initial DL BWP configuration		1, 2, 3	DLBWP.0.1			DLBWP.0.1		
Initial UL BWP configuration		1, 2, 3	ULBWP.0.1			ULBWP.0.1		
RLM-RS		1, 2, 3	SSB			SSB		
$\hat{E}_s/I_{ot}$	dB	1	4	-infinity	-infinity	-infinity	-infinity	4
		2						
		3						
N_{oc} Note2	dBm/SCS	1	-98					
		2	-98					
		3	-95					
N_{oc} Note2	dBm/15 kHz	1	-98					
		2						
		3						
$\hat{E}_s/N_{oc}$	dB	1	4	-infinity	-infinity	-infinity	-infinity	4
		2						
		3						
SS-RSRP Note3	dBm/SCS	1	-94	-infinity	-infinity	-infinity	-infinity	-94
		2	-94	-infinity	-infinity	-infinity	-infinity	-94
		3	-91	-infinity	-infinity	-infinity	-infinity	-91
Io	dBm/9.36 MHz	1	-64.59	-70.05	-70.05	-70.05	-70.05	-64.59
	dBm/9.36 MHz	2	-64.59	-70.05	-70.05	-70.05	-70.05	-64.59
	dBm/38.16 MHz	3	-58.50	-63.94	-63.94	-63.94	-63.94	-58.50
Propagation Condition		1, 2, 3	AWGN					
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.								
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.								
Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.								

The RRC re-establishment delay is defined as the time from the start of time period T3, to the moment when the UE starts to send PRACH preambles to cell 2 for sending the *RRCReestablishmentRequest* message to cell 2.

The RRC re-establishment delay to an unknown NR intra frequency cell without serving cell timing shall be less than 2.2 s.

The rate of correct RRC re-establishments observed during repeated tests shall be at least 90%.

NOTE: The RRC re-establishment delay in the test is derived from the following expression:

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

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

$T_{identify\_intra\_NR}$ = 800 ms

T_{SI} = 1280 ms; it is the time required for receiving all the relevant system information as defined in TS 38.331 [13] for the target intra-frequency NR cell.

T_{PRACH} = 15 ms; it is the additional delay caused by the random access procedure.

This gives a total of 2145 ms, allow 2.2 s in the test case.

6.3.2.2 Random access

6.3.2.2.0 Minimum conformance requirements

6.3.2.2.0.1 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 38.101-1 [2] Table 6.3.4.2-1. The relative power applied to additional preambles shall have an accuracy as specified in TS 38.101-1 [2] Table 6.3.4.3-1.

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

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

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

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

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

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

The UE shall re-transmit the msg3 upon the reception of 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] clauses 6.2.2.

6.3.2.2.0.2 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 38.101-1 [2] Table 6.3.4.2-1. The relative power applied to additional preambles shall have an accuracy as specified in TS 38.101-1 [2] Table 6.3.4.3-1.

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

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

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

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

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

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

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

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

6.3.2.2.1 NR SA FR1 contention based random access

6.3.2.2.1.1 Test purpose

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

6.3.2.2.1.2 Test applicability

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

6.3.2.2.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 6.3.2.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clauses A.6.3.2.2.1.

6.3.2.2.1.4 Test description

6.3.2.2.1.4.1 Initial conditions

This test can be run in the configurations defined in Table 6.3.2.2.1.4.1-1.

Table 6.3.2.2.1.4.1-1: Contention based random access test in FR1 for NR standalone supported test configurations

Test Case ID	Test Config Index	Description
6.3.2.2.1-1	1	NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
6.3.2.2.1-2	2	NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
Note: The UE is only required to be tested in one of the supported test configurations		

Configure the test equipment and the DUT according to the parameters in Table 6.3.2.2.1.4.1-2.

Table 6.3.2.2.1.4.1-2: Initial conditions for Contention based random access test in FR1 for NR standalone

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.3.2.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 6.3.2.2.1.4.3.

2. Cell 1 is the NR FR1 serving cell (PCell). The connection setup is done according to the settings in Annex C.1.1 and C.1.2.

6.3.2.2.1.4.2 Test procedure

The test consists of a single cell, configured as PCell in FR1. The System Simulator shall not explicitly assign a random access preamble via dedicated signalling in the downlink.

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

2. Set the parameters according to Table 6.3.2.2.1.5-1.

3. 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 4 preambles, the System Simulator shall transmit a Random Access Response containing Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

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

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

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

    5.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 6.3.2.2.1.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in 6.3.2.2.1.5.

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

    6.1. Repeat steps 1-3.

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

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

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

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

    6.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 6.3.2.2.1.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in 6.3.2.2.1.5.

7. Test 4: Correct behaviour when receiving 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 6.3.2.2.1.5.

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

   9.1. Repeat steps 1-3.

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

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

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

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

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

    10.1. Repeat steps 1-3.

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

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

    10.4. The System Simulator shall not send a response.

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

    10.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 6.3.2.2.1.5.

6.3.2.2.1.4.3 Message contents

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

Table 6.3.2.2.1.4.3-0: Common Exception messages

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

Table 6.3.2.2.1.4.3-1: *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 6.3.2.2.1.4.3-2: RACH-ConfigCommon for 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		
ssb-perRACH-OccasionAndCB-PreamblesPerSSB CHOICE {			
oneFourth	n48		FR1
}			
groupBconfigured SEQUENCE {			
numberOfRA-PreamblesGroupA	48		
}			
ra-ContentionResolutionTimer	sf48		
rsrp-ThresholdSSB	RSRP_51		
prach-RootSequenceIndex CHOICE {			
0			
}			
msg1-SubcarrierSpacing	kHz 15		
	kHz 30		
}			

Table 6.3.2.2.1.4.3-3: RACH-ConfigGeneric for 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	102		FR1
msg1-FDM	one		FR1
zeroCorrelationZoneConfig	11		
preambleReceivedTargetPower	-120		
preambleTransMax	n6		
powerRampingStep	dB2		
ra-ResponseWindow	sl10		
}			

Table 6.3.2.2.1.4.3-4: *ServingCellConfigCommonSIB* for 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	-5		
}			

6.3.2.2.1.5   Test requirement

Table 6.3.2.2.1.5-1 defines the primary level settings for contention based random access test in FR1 for NR Standalone. Tables 6.3.2.2.1.5-2, 6.3.2.2.1.5-3 and 6.3.2.2.1.5-4 define the Absolute power limits, Relative power limits and uplink timing error limits respectively, and all include test tolerances.

Table 6.3.2.2.1.5-1: General test parameters for contention based random access test in FR1 for NR Standalone

Parameter			Unit	Test-1	Comments
SSB Configuration	Config 1			SSB.1 FR1	As defined in A.3.1, except for number of SSBs per SS-burst and SS/PBCH block index as below
	Config 2			SSB.2 FR1	
Number of SSBs per SS-burst				2	Different from the definition in A.3.1
SS/PBCH block index				0,1	Different from the definition in A.3.1
Duplex Mode for Cell 2	Config 1			FDD	
	Config 2			TDD	
TDD Configuration	Config 2			TDDConf.2.1	
CSI-RS for tracking	Config 1			TRS.1.1 FDD	
	Config 2			TRS.1.2 TDD	
OCNG Pattern Note 1				OP.1	As defined in A.2.1
PDSCH parameters Note 4	Config 1			SR.1.1 FDD	As defined in A.1.1
	Config 2			SR.2.1 TDD	
RMSI CORESET Reference Channel	Config 1			CR.1.1 FDD	
	Config 2			CR.2.1 TDD	
Dedicated CORESET Reference Channel	Config 1			CCR.1.1 FDD	
	Config 2			CCR.2.1 TDD	
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		
SSB with index 0	$\hat{E}_s/I_{ot}$		dB	3	Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB*
	N_{oc}	Config 1	dBm/15kHz	-98	
		Config 2		-101	
	$\hat{E}_s/N_{oc}$		dB	3	
	SS-RSRP	Config 1	dBm/15kHz	-95	
		Config 2		-98	
	SS-RSRP		dBm/ SCS	-95	

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

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

Test 1: Correct behaviour when transmitting Random Access Preamble

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

Test 2: Correct behaviour when receiving Random Access Response

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 6.3.2.2.1.5-2.

- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 6.3.2.2.1.5-3.

- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 6.3.2.2.1.5-4.

Test 3: Correct behaviour when not receiving Random Access Response

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 6.3.2.2.1.5-2.

- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 6.3.2.2.1.5-3.

- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 6.3.2.2.1.5-4.

Test 4: Correct behaviour when receiving 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 -22 dBm within the accuracy specified in Table 6.3.2.2.1.5-2.

- The transmit timing of the PRACH transmission shall be within the accuracy specified in Table 6.3.2.2.1.5-4.

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

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

Test 7: Correct behaviour when contention resolution timer expires

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

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 6.3.2.2.1.5-2.

- The transmit timing of the PRACH transmission shall be within the accuracy specified in Table 6.3.2.2.1.5-4.

Table 6.3.2.2.1.5-2 Absolute power tolerance Test requirements

Conditions	Tolerance
Normal	± 11.1 dB

Table 6.3.2.2.1.5-3 Relative power tolerance Test requirements

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

Table 6.3.2.2.1.5-4: T_e Timing error Test requirements

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

6.3.2.2.2 NR SA FR1 non-contention based random access

6.3.2.2.2.1 Test purpose

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

6.3.2.2.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards. Additionally Test 2 is applicable to UE that supports CSI-RS based Random Access Preamble which requires UE to support csi-RSRP-AndRSRQ-MeasWithSSB or csi-RSRP-AndRSRQ-MeasWithoutSSB.

6.3.2.2.2.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 6.3.2.2.0.2.

The normative reference for this requirement is TS 38.133 [6] clauses A.6.3.2.2.2.

6.3.2.2.2.4 Test description

6.3.2.2.2.4.1 Initial conditions

This test can be run in the configurations defined in Table 6.3.2.2.2.4.1-1.

Table 6.3.2.2.2.4.1-1: Non-Contention based random access test in FR1 for NR standalone supported test configurations

Test Case ID	Test Config Index	Description
6.3.2.2.2-1	1	NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
6.3.2.2.2-2	2	NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
Note: The UE is only required to be tested in one of the supported test configurations		

Configure the test equipment and the DUT according to the parameters in Table 6.3.2.2.2.4.1-2.

Table 6.3.2.2.2.4.1-2: Initial conditions for Non-Contention based random access test in FR1 for NR standalone

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] subclause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.3.2.2.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 6.3.2.2.2.4.3.

2. Cell 1 is the NR FR1 serving cell (PCell). The connection setup is done according to the settings in Annex C.1.1 and C.1.2.

6.3.2.2.2.4.2 Test procedure

The test consists of a single cell, configured as PCell in FR1. The System Simulator shall explicitly assign a random access preamble via dedicated signalling in the downlink. There are two subtests, to test both SSB-based non-contention based random access (subtest 1) and CSI-RS-based non-contention based random access (subtest 2).

1. Ensure the UE is in state RRC_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. Establish SRB2 and DRB in the RRC Reconfiguration message.

2. Set the parameters according to Table 6.3.2.2.2.5-1 Subtest 1.

3. The SS shall signal a Random Access Preamble ID via a RRCReconfiguration message to the UE and initiate a Non-contention based Random Access procedure according to Table 6.3.2.2.2.4.3-3 and Table 6.3.2.2.2.4.3-4.

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

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

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

   5.1. Set the parameters according to Table 6.3.2.2.2.5-1 Subtest 2.

   5.2. Repeat steps 1-3.

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

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

   6.1. Repeat steps 1-3.

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

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

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

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

6.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 6.3.2.2.2.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in 6.3.2.2.2.5.

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

7.1. Repeat steps 1-3.

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

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

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

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

7.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in 6.3.2.2.2.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in 6.3.2.2.2.5.

6.3.2.2.2.4.3   Message contents

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

Table 6.3.2.2.2.4.3-0: Common Exception messages

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

Table 6.3.2.2.2.4.3-1: *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 6.3.2.2.2.4.3-2: 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		
}			
rsrp-ThresholdSSB	RSRP_51		Subtest 1
prach-RootSequenceIndex CHOICE {			
0			
}			
msg1-SubcarrierSpacing	kHz 15		
	kHz 30		
}			

Table 6.3.2.2.2.4.3-3: CellGroupConfig for Non-Contention Based Random Access

Derivation Path: TS 38.508-1 [14], table 4.6.3-19			
Information Element	**Value/remark**	**Comment**	**Condition**
CellGroupConfig ::= SEQUENCE {			
spCellConfig SEQUENCE {			
servCellIndex	ServCellIndex		
reconfigurationWithSync SEQUENCE {			
newUE-Identity	1		
t304	ms1000		
rach-ConfigDedicted			
uplink	RACH-ConfigDedicated		
}			
spCellConfigDedicated SEQUENCE {			
uplinkConfig SEQUENCE {			
initialUplinkBWP SEQUENCE {			
srs-Config	SRS-Config		
}			
}			
}			
}			
}			

Table 6.3.2.2.2.4.3-4: 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 {	1 entry		
ssb[1]	0		
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_51		Subtest 2
}			
}			
}			
}			

Table 6.3.2.2.2.4.3-5: 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	102		
msg1-FDM	one		
zeroCorrelationZoneConfig	11		
preambleReceivedTargetPower	-120		
preambleTransMax	n6		
powerRampingStep	dB2		
ra-ResponseWindow	sl10		
}			

Table 6.3.2.2.2.4.3-6: *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	-5		
}			

6.3.2.2.2.5 Test requirement

Table 6.3.2.2.2.5-1 defines the primary level settings for non-contention based random access test in FR1 for NR Standalone. Tables 6.3.2.2.2.5-2, 6.3.2.2.2.5-3 and 6.3.2.2.2.5-4 define the Absolute power limits, Relative power limits and uplink timing error limits respectively, and all include test tolerances.

Table 6.3.2.2.2.5-1: General test parameters for non-contention based random access test in FR1 for NR Standalone

Parameter		Unit	Subtest 1	Subtest 2	Comments
SSB Configuration	Config 1		SSB.1 FR1	SSB.1 FR1	As defined in A.3.10, except for number of SSBs per SS-burst and SS/PBCH block index as below
	Config 2		SSB.2 FR1	SSB.2 FR1	
Number of SSBs per SS-burst			2	2	Different from the definition in A.3.10
SS/PBCH block index			0,1	0,1	Different from the definition in A.3.10
CSI-RS Configuration	Config 1		N/A	CSI-RS.1.1 FDD	As defined in A.3.1.4
	Config 2			CSI-RS.2.1 TDD	
Duplex Mode for Cell 2	Config 1		FDD	FDD	
	Config 2		TDD	TDD	
TDD Configuration	Config 2		TDDConf.2.1	TDDConf.2.1	
CSI-RS for tracking	Config 1		TRS.1.1 FDD	TRS.1.1 FDD	
	Config 2		TRS.1.2 TDD	TRS.1.2 TDD	
OCNG Pattern Note 1			OCNG pattern 1	OCNG pattern 1	As defined in A.3.2.1.
PDSCH parameters Note 4	Config 1		SR.1.1 FDD	SR.1.1 FDD	As defined in A.3.1.1.
	Config 2		SR.2.1 TDD	SR.2.1 TDD	
RMSI CORESET Reference Channel	Config 1		CR.1.1 TDD	CR.1.1 TDD	
	Config 2		CR.2.1 TDD	CR.2.1 TDD	
Dedicated CORESET Reference Channel	Config 1		CCR.1.1 TDD	CCR.1.1 TDD	
	Config 2		CCR.2.1 TDD	CCR.2.1 TDD	
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			
SSB with index 0	$\hat{E}_s/I_{ot}$	dB	3	3	Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB*
	N_{oc} Config 1	dBm/15kHz	-98	-98	
	Config 2		-101	-101	
	$\hat{E}_s/N_{oc}$	dB	3	3	
	SS-RSRP Note 3 Config 1	dBm/15kHz	-95	-95	
	Config 2		-98	-98	
	SS-RSRP Note 3	dBm/ SCS	-95	-95	
SSB with index 1	$\hat{E}_s/I_{ot}$	dB	-17	-17	Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB*
	N_{oc} Config 1	dBm/15kHz	-98	-98	
	Config 2		-101	-101	
	$\hat{E}_s/N_{oc}$	dB	-17	-17	
	SS-RSRP Note 3 Config 1	dBm/15kHz	-115	-115	
	Config 2		-118	-118	
	SS-RSRP Note 3	dBm/ SCS	-115	-115	
Io Note 2	Config 1	dBm	-65.3/9.36MHz	-65.3/9.36MHz	For symbols without SSB index 1
	Config 2		-62.2/38.16MHz	-62.2/38.16MHz	
ss-PBCH-BlockPower		dBm/ SCS	-5	-5	As defined in clause 6.3.2 in TS 38.331 [13].
Configured UE transmitted power ($P_{\text{CMAX, f,c}}$)		dBm	23	23	As defined in clause 6.2.4 in TS 38.101-1 [2].
PRACH Configuration			FR1 PRACH configuration 2	FR1 PRACH configuration 3	As defined in A.3.8.
Propagation Condition		-	AWGN	AWGN	

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

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

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

- The Random Access Preamble shall arrive on a PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0.

- The selected PRACH occasion shall belong to the PRACH occasions permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex*.

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

- The Random Access Preamble shall have the Preamble Index associated with the CSI-RS configured.

- The Random Access Preamble shall arrive on a PRACH occasion which belongs to the PRACH occasions corresponding to the CSI-RS configured.

- The selected PRACH occasion belongs to the PRACH occasions permitted by the restrictions given by the *ra-OccasionList*.

Test 3: Correct behaviour when receiving Random Access Response

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 6.3.2.2.2.5-2.

- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 6.3.2.2.2.5-3.

- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 6.3.2.2.2.5-4.

Test 4: Correct behaviour when not receiving Random Access Response

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 6.3.2.2.2.5-2.

- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 6.3.2.2.2.5-3.

- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 6.3.2.2.2.5-4.

Table 6.3.2.2.2.5-2 Absolute power tolerance Test requirements

Conditions	Tolerance
Normal	± 11.1 dB

Table 6.3.2.2.2.5-3 Relative power tolerance Test requirements

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

Table 6.3.2.2.2.5-4: T_e Timing error Test requirements

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

6.3.2.2.3 NR SA FR1 2-step contention based random access

6.3.2.2.3.1 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.

6.3.2.2.3.2 Test applicability

This test applies to all types of NR FR1 UE from Release 16 onwards.

6.3.2.2.3.3 Minimum conformance requirement

Same as in clause 4.3.2.2.3.3.

The normative reference for this requirement is TS 38.133 [6] clause 6.2.2 and A.6.3.2.2.3.

6.3.2.2.3.4 Test description

6.3.2.2.3.4.1 Initial conditions

This test can be run in the configurations defined in Table 6.3.2.2.3.4.1-1.

Table 6.3.2.2.3.4.1-1: Supported test configurations

Test Case ID	Test Config Index	Description
6.3.2.2.3-1	1	NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
6.3.2.2.3-2	2	NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
Note: The UE is only required to be tested in one of the supported test configurations		

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 6.3.2.2.3.4.1-2.

Table 6.3.2.2.3.4.1-2: Initial conditions

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, E.1.1, E.1.3.1 and Table E.3-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 4.3.2.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 6.3.2.2.3.4.3.

2. Cell 1 is the NR FR1 serving cell (PCell). The connection setup is done according to the settings in Annex C.1.1 and C.1.2.

6.3.2.2.3.4.2 Test procedure

The test consists of a single cell, configured as PCell in FR1. The System Simulator shall not explicitly assign a random access preamble via dedicated signalling in the downlink.

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

2. Set the parameters according to Table 6.3.2.2.1.5-1.

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

   4.2 Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 6.3.2.2.3.5. Measure the power of the first MsgA PUSCH transmission and it shall not exceed the values specified in clause 6.3.2.2.3.5.

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 4 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 a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

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

   5.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 6.3.2.2.3.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in clause 6.3.2.2.3.5. Measure the power of the first MsgA PUSCH transmission and it shall not exceed the values specified in clause 6.3.2.2.3.5.

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 4 preambles.

   6.3. As no MsgB was received within the RA Response window, 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.

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

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

   6.6 Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 6.3.2.2.3.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in clause 6.3.2.2.3.5. Measure the power of the first MsgA PUSCH transmission and it shall not exceed the values specified in clause 6.3.2.2.3.5.

6.3.2.2.3.4.3 Message contents

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

Table 6.3.2.2.3.4.3-0: Common Exception messages

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

6.3.2.2.3.5 Test requirement

Table 6.3.2.2.3.5-2 defines the primary level settings for contention based random access test in FR1 for NR Standalone.

Table 6.3.2.2.1.5-1: General test parameters

Parameter		Unit	Test-1	Comments
SSB Configuration	Config 1		SSB.1 FR1	As defined in A.3.1, except for number of SSBs per SS-burst and SS/PBCH block index as below
	Config 2		SSB.2 FR1	
Number of SSBs per SS-burst			2	Different from the definition in A.3.1
SS/PBCH block index			0,1	Different from the definition in A.3.1
Duplex Mode for Cell 2	Config 1		FDD	
	Config 2		TDD	
TDD Configuration	Config 2		TDDConf.2.1	
CSI-RS for tracking	Config 1		TRS.1.1 FDD	
	Config 2		TRS.1.2 TDD	
OCNG Pattern Note 1			OP.1	As defined in A.2.1
PDSCH parameters Note 4	Config 1		SR.1.1 FDD	As defined in A.1.1
	Config 2		SR.2.1 TDD	
NR RF Channel Number			1	
EPRE ratio of PSS to SSS		dB		
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		
SSB with index 0	$\hat{E}_s / I_{ot}$	dB	3	Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB*
	N_{oc} Config 1	dBm/15kHz	-98	
	N_{oc} Config 2		-101	
	$\hat{E}_s / N_{oc}$	dB	3	
	SS-RSRP Config 1	dBm/15kHz	-95	
	SS-RSRP Config 2		-98	
	SS-RSRP	dBm/ SCS	-95	
SSB with index 1	$\hat{E}_s / I_{ot}$	dB	-17	Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB*
	N_{oc} Config 1	dBm/15kHz	-98	
	N_{oc} Config 2		-101	
	$\hat{E}_s / N_{oc}$	dB	-17	
	SS-RSRP Config 1	dBm/15kHz	-115	
	SS-RSRP Config 2		-118	
	SS-RSRP	dBm/ SCS	-115	
Io Note 2	Config 1	dBm	-65.3/9.36MHz	

Parameter		Unit	Test-1	Comments
	Config 2		-62.2/38.16MHz	For symbols without SSB index 1
ss-PBCH-BlockPower		dBm/ SCS	-5	As defined in clause 6.3.2 in TS 38.331 [13].
Configured UE transmitted power ($P_{\text{CMAX, f,c}}$)		dBm	23	As defined in clause 6.2.4 in TS 38.101-1 [2].
MsgA Configuration			FR1 MsgA configuration 1	As defined in FFS.
msgA-RSRP-ThresholdSSB		dBm	RSRP_51	The actual value of the threshold is -105dBm, as defined in TS 38.331 [13].
Propagation Condition		-	AWGN	
Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.				
Note 2: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.				
Note 3: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.				

Test 1: Correct behaviour when transmitting MsgA:

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

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 6.3.2.2.3.5-2.

- The power of the first MsgA PUSCH transmission shall be 6.6 dBm for test configuration 1 and 9.6 dBm for test configuration 2 within the accuracy specified in Table 6.3.2.2.3.5-2A.

Test 2: Correct behaviour when receiving MsgB:

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 6.3.2.2.3.5-2.

- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 6.3.2.2.3.5-3.

- The transmit timing of all MsgA PRACH transmissions shall be within the accuracy specified in Table 6.3.2.2.3.5-4.

- The power of the first MsgA PUSCH transmission shall be 6.6 dBm for test configuration 1 and 9.6 dBm for test configuration 2 within the accuracy specified in Table 6.3.2.2.3.5-2A.

Test 3: Correct behaviour when not receiving MsgB:

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 6.3.2.2.3.5-2.

- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 6.3.2.2.3.5-3.

- The transmit timing of all MsgA PRACH transmissions shall be within the accuracy specified in Table 6.3.2.2.3.5-4.

- The power of the first MsgA PUSCH transmission shall be 6.6 dBm for test configuration 1 and 9.6 dBm for test configuration 2 within the accuracy specified in Table 6.3.2.2.3.5-2A.

Table 6.3.2.2.3.5-2: MsgA PRACH Absolute power tolerance Test requirements

Conditions	Tolerance
Normal	± 11.1 dB

Table 6.3.2.2.3.5-2A: MsgA PUSCH Absolute power tolerance Test requirements

Conditions	Tolerance
Normal	± 11.1 dB

Table 6.3.2.2.3.5-3: Relative power tolerance Test requirements

Power step ΔP (Up or down) (dB)	MsgA PRACH (dB)
$2 \leq \Delta P < 3$	± 3.2 dB

Table 6.3.2.2.3.5-4: T_e Timing error Test requirements

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

6.3.2.2.4 NR SA FR1 2-step non-contention based random access

6.3.2.2.4.1 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.

6.3.2.2.4.2 Test applicability

This test applies to all types of NR FR1 UE from Release 16 onwards.

6.3.2.2.4.3 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.6.3.2.2.4.

6.3.2.2.4.4 Test description

6.3.2.2.4.4.1 Initial conditions

This test can be run in the configurations defined in Table 6.3.2.2.4.4.1-1.

Table 6.3.2.2.4.4.1-1: Supported test configurations

Test Case ID	Test Config Index	Description
6.3.2.2.4-1	1	NR: 15 kHz SSB SCS, 10MHz bandwidth, FDD
6.3.2.2.4-2	2	NR: 30 kHz SSB SCS, 40MHz bandwidth, TDD
Note: The UE is only required to be tested in one of the supported test configurations		

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 6.3.2.2.4.4.1-2.

Table 6.3.2.2.4.4.1-2: Initial conditions

Parameter	Value	Comment
Test environment	NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified in Annex E, E.1.1, E.1.3.1 and Table E.3-1 and TS 38.508-1 [14] clause 4.3.1.	

Channel bandwidth	As specified by the test configuration selected from Table 4.3.2.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 6.3.2.2.4.4.3.

2. Cell 1 is the NR FR1 serving cell (PCell). The connection setup is done according to the settings in Annex C.1.1 and C.1.2.

6.3.2.2.4.4.2   Test procedure

The test consists of a single cell, configured as PCell in FR1. The System Simulator shall explicitly assign a random access preamble via dedicated signalling in the downlink.

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 6.3.2.2.1.5-1.

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 a MsgA to the System Simulator. The System Simulator shall check that the MsgA preamble belongs to one of the Random Access Preambles 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 *msgA-SSB-SharedRO-MaskIndex*.

   4.2 Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 6.3.2.2.4.5. Measure the power of the first MsgA PUSCH transmission and it shall not exceed the values specified in clause 6.3.2.2.4.5.

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 4 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 a Random Access Preamble identifier matching the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator.

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

   5.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 6.3.2.2.4.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in clause 6.3.2.2.4.5. Measure the power of the first MsgA PUSCH transmission and it shall not exceed the values specified in clause 6.3.2.2.4.5.

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 4 preambles.

6.3. As no MsgB was received within the MsgB Response window configured in *RACH-ConfigGenericTwoStepRA*, 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.

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

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

6.6. Measure the power and timing of the first preamble and it shall not exceed the values specified in clause 6.3.2.2.3.5. Measure the relative power and timing applied to additional preambles (last 4 preambles) and it shall not exceed the values specified in clause 6.3.2.2.3.5. Measure the power of the first MsgA PUSCH transmission and it shall not exceed the values specified in clause 6.3.2.2.4.5.

6.3.2.2.4.4.3 Message contents

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

Table 6.3.2.2.4.4.3-0: Common Exception messages

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

6.3.2.2.4.5 Test requirement

Table 6.3.2.2.4.5-2 defines the primary level settings for non-contention based random access test in FR1 for NR Standalone.

Table 6.3.2.2.1.5-1: General test parameters

Parameter		Unit	Test-1	Comments
SSB Configuration	Config 1		SSB.1 FR1	As defined in A.3.1, except for number of SSBs per SS-burst and SS/PBCH block index as below
	Config 2		SSB.2 FR1	
Number of SSBs per SS-burst			2	Different from the definition in A.3.1
SS/PBCH block index			0,1	Different from the definition in A.3.1
Duplex Mode for Cell 2	Config 1		FDD	
	Config 2		TDD	
TDD Configuration	Config 2		TDDConf.2.1	
CSI-RS for tracking	Config 1		TRS.1.1 FDD	
	Config 2		TRS.1.2 TDD	
OCNG Pattern Note 1			OP.1	As defined in A.2.1
PDSCH parameters Note 4	Config 1		SR.1.1 FDD	As defined in A.1.1
	Config 2		SR.2.1 TDD	
NR RF Channel Number			1	
EPRE ratio of PSS to SSS	dB			
EPRE ratio of PBCH_DMRS to SSS	dB		0	
EPRE ratio of PBCH to PBCH_DMRS	dB			
EPRE ratio of PDCCH_DMRS to SSS	dB			

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

Test 1: Correct behaviour when transmitting MsgA:

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

- The MsgA 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 *msgA-SSB-SharedRO-MaskIndex*.

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 6.3.2.2.4.5-2.

- The power of the first MsgA PUSCH transmission shall be 6.6 dBm for test configuration 1 and 9.6 dBm for test configuration 2 within the accuracy specified in Table 6.3.2.2.4.5-2A.

Test 2: Correct behaviour when receiving MsgB:

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 6.3.2.2.4.5-2.

- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 6.3.2.2.4.5-3.

- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 6.3.2.2.4.5-4.

- The power of the first MsgA PUSCH transmission shall be 6.6 dBm for test configuration 1 and 9.6 dBm for test configuration 2 within the accuracy specified in Table 6.3.2.2.4.5-2A.

Test 3: Correct behaviour when not receiving MsgB:

- The power of the first preamble shall be -22 dBm within the accuracy specified in Table 6.3.2.2.4.5-2.

- The relative power for preamble ramping step shall be 2 dB within the accuracy specified in Table 6.3.2.2.4.5-3.

- The transmit timing of all PRACH transmissions shall be within the accuracy specified in Table 6.3.2.2.4.5-4.

- The power of the first MsgA PUSCH transmission shall be 6.6 dBm for test configuration 1 and 9.6 dBm for test configuration 2 within the accuracy specified in Table 6.3.2.2.4.5-2A.

Table 6.3.2.2.4.5-2: MsgA PRACH Absolute power tolerance Test requirements

Conditions	Tolerance
Normal	± 11.1 dB

Table 6.3.2.2.4.5-2A: MsgA PUSCH Absolute power tolerance Test requirements

Conditions	Tolerance
Normal	± 11.1 dB

Table 6.3.2.2.4.5-3: Relative power tolerance Test requirements

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

Table 6.3.2.2.4.5-4: T_e Timing error Test requirements

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

6.3.2.3 RRC connection release with redirection

6.3.2.3.0 Minimum conformance requirements

6.3.2.3.0.1 Minimum conformance requirements for FR1 RRC connection release with redirection

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

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

$$T_{connection\_release\_redirect\_NR} = T_{RRC\_procedure\_delay} + T_{identify\text{-}NR} + T_{SI\text{-}NR} + T_{RACH}$$

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

- SSB_RP and SSB Ês/Iot according to Annex B.2.5 for a corresponding NR Band.

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

$T_{identify\text{-}NR}$: It is the time to identify the target NR cell and depend on the frequency range (FR) of the target NR cell. It is defined in table 6.3.2.3.0.1-1. Note that $T_{identify\text{-}NR} = T_{PSS/SSS\text{-}sync} + T_{meas}$, in which $T_{PSS/SSS\text{-}sync}$ is the cell search time and T_{meas} is the measurement time due to cell selection criteria evaluation.

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

before the RRC connection is released. $T_{SI-NR} = 0$ provided the UE is provided with the SI (including MIB and all relevant SIBs) of the target NR cell before the RRC connection is released by the old NR cell.

T_{RACH}: It is the delay caused due to the random access procedure when sending random access to the target NR cell. This delay depends on the PRACH configuration defined in Table 6.3.3.2-2 [6] or Table 6.3.3.2-3 [6] for FR1 and in Table 6.3.3.2-4 [6] for FR2.

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

- the requirement in this section is applied with $T_{rs} = 20$ ms assuming the SSB transmission periodicity is not larger than 20 ms,

- there is no requirement if the SSB transmission periodicity is larger than 20ms.

Table 6.3.2.3.0.1-1: Time to identify target NR cell for RRC connection release with redirection to NR

Frequency range (FR) of target NR cell	$T_{identify-NR}$
FR1	MAX (680 ms, [11] x T_{rs})
FR2	MAX (880 ms, 8x[11] x T_{rs})
Note :	If the UE has been provided with higher layer in TS 38.331 [2] signalling of *smtc2* prior to the redirection command, SMTC follows *smtc1* or *smtc2* according to the physical cell ID of the target cell.

The normative reference for this requirement is TS 38.133 [6] clauses 6.2.3.2.1.

6.3.2.3.0.2 Minimum conformance requirements for FR1 – E-UTRAN RRC connection release with redirection

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

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

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

The target E-UTRA FDD or TDD cell shall be considered detectable when for each relevant SSB:

- RSRP related conditions in the accuracy requirements in Section 10.2.2 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2 and Annex B.3 of TS 36.133 [15],

- RSRQ related conditions in the accuracy requirements in Section 10.2.3 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2 and Annex B.3 of TS 36.133 [15],

- RS-SINR related conditions in the accuracy requirements in Section 10.2.5 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2 and Annex B.3 of TS 36.133 [15].

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

$T_{identify-E-UTRA}$: It is the time to identify the target E-UTRA cell. It shall be less than 320 ms.

$T_{SI-E-UTRA}$: It is the time required for acquiring all the relevant system information of the target E-UTRA cell. This time depends upon whether the UE is provided with the relevant system information (SI) of the target E-UTRA cell or not by the old NR cell before the RRC connection is released. $T_{SI-E-UTRA} = 0$ provided the UE is provided with the SI (including MIB and all relevant SIBs) of the target E-UTRA cell before the RRC connection is released by the old NR cell.

T_{RACH}: It is the delay caused due to the random access procedure when sending random access to the target E-UTRA cell.

The normative reference for this requirement is TS 38.133 [6] clauses 6.2.3.2.2.

6.3.2.3.1 NR SA FR1 RRC connection release with redirection

6.3.2.3.1.1 Test purpose

This test is to verify RRC connection release with redirection from NR to NR.

6.3.2.3.1.2 Test applicability

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

6.3.2.3.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 6.3.2.3.0.1.

The normative reference for this requirement is TS 38.133 [6] A.6.3.2.3.1.

6.3.2.3.1.4 Test description

6.3.2.3.1.4.1 Initial conditions

This test can be run in the configurations defined in Table 6.3.2.3.1.4.1-1.

Table 6.3.2.3.1.4.1-1: Redirection from NR to NR test configurations

Configuration	Description
6.3.2.3.1-1	Source cell: NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode Target cell: NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode
6.3.2.3.1-2	Source cell: NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode Target cell: NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode
6.3.2.3.1-3	Source cell: NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode Target cell: NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode
Note:	The UE is only required to be tested in one of the supported test configurations.

Configure the test equipment and the DUT according to the parameters in Table 6.3.2.3.1.4.1-2.

Table 6.3.2.3.1.4.1-2: Initial conditions for Redirection from NR to NR test 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 6.3.2.3.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. The general test parameters for PCell and neighbour cell are given in Table 6.3.2.3.1.4.1-3 below.

2. Message contents are defined in clause 6.3.2.3.1.4.3.

3. There are two carriers and two NR cells specified in the test. Cell 1 and Cell 2 are configured according to Annex C.1.1 and C.1.2.

Table 6.3.2.3.1.4.1-3: General test parameters for Redirection from NR to NR test case

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
Filter coefficient			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	2.3	

6.3.2.3.1.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. The "*RRCRelease*" message shall be sent to the UE during period T1 and the start of T2 is the instant when the last TTI containing the RRC message is sent to the UE. Prior to time duration T2, the UE shall not have any timing information of Cell 2. Cell 2 is powered up at the beginning of the T2. Cell 1 and Cell 2 belong to different tracking areas.

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. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 6.3.2.3.1.5-1. T1 starts.

3. SS shall transmit an *RRCRelease* during period T1.

4. The SS shall switch the power setting from T1 to T2 as specified in Table 6.3.2.3.1.5-1. When the last TTI containing the *RRCRelease* message is sent to UE, T2 starts.

5. If the UE transmits the PRACH to Cell 2 less than 2240 ms from the beginning of time period T2 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

6. After T2 expires, the UE shall be switched off. 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 and Cell 2 shall be powered OFF.

7. The SS shall set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.

8. Repeat step 2-7 until the confidence level according to Table G.2.3-1 in Annex G clause G.2 is achieved.

6.3.2.3.1.4.3 Message contents

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

Table 6.3.2.3.1.4.3-1: RRCRelease for NR RRC redirection

Derivation Path: TS 38.508-1 [14], Table 4.6.1-16			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCRelease ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcRelease SEQUENCE {			
redirectedCarrierInfo CHOICE {			
nr SEQUENCE {			
carrierFreq	ARFCN-ValueNR	Frequency of Cell 2	
ssbSubcarrierSpacing	kHz15		Config 1,2
	kHz30		Config 3
smtc SEQUENCE {			
duration	sf1		SMTC.1
	sf5		SMTC.2
}			
}			
}			
}			
}			
}			

Table 6.3.2.3.1.4.3-2: SIB2

Derivation Path: TS 38.508-1 [14], Table 4.6.2-1			
Information Element	**Value/remark**	**Comment**	**Condition**
SIB2 ::= SEQUENCE {			
cellReselectionInfoCommon SEQUENCE {			

rangeToBestCell	Not present		
}			

6.3.2.3.1.5 Test requirement

Table 6.3.2.3.1.5-1 defines the primary level settings for Redirection from NR to NR test case.

Table 6.3.2.3.1.5-1: Cell specific test parameters for Redirection from NR to NR test case

Parameter		Unit	Cell 1		Cell 2	
			T1	T2	T1	T2
NR RF Channel Number			1		2	
Duplex mode	Config 1		FDD			
	Config 2,3		TDD			
SSB Configuration	Config 1		SSB.1 FR1			
	Config 2		SSB.1 FR1			
	Config 3		SSB.2 FR1			
CSI-RS for tracking	Config 1		TRS.1.1 FDD			
	Config 2		TRS.1.1 TDD			
	Config 3		TRS.1.2 TDD			
TDD configuration	Config 1		Not Applicable			
	Config 2		TDDConf.1.1			
	Config 3		TDDConf.2.1			
BW$_{channel}$	Config 1		10: $N_{RB,c}$ = 52			
	Config 2	MHz	10: $N_{RB,c}$ = 52			
	Config 3		40: $N_{RB,c}$ = 106			
BWP BW	Config 1		10: $N_{RB,c}$ = 52			
	Config 2	MHz	10: $N_{RB,c}$ = 52			
	Config 3		40: $N_{RB,c}$ = 106			
DRx Cycle		ms	Not Applicable			
PDSCH Reference measurement channel	Config 1		SR.1.1 FDD			
	Config 2		SR.1.1 TDD			
	Config 3		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			
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 1			
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						
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS		dB	0			
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
N_{oc} Note2		dBm/15kHz	-98			
N_{oc} Note2	Config 1,2	dBm/SCS	-98			
	Config 3		-95			
$\hat{E}_s/I_{ot}$		dB	4	4	-infinity	4

$\hat{E}_s/N_{oc}$		dB	4	4	-infinity	4
Io[Note3]	Config 1,2	dBm/ 9.36MHz	-64.59	-64.59	-70.05	-64.59
	Config 3	dBm/ 38.16MHz	-58.49	-58.49	-63.94	-58.49
Propagation condition		-	AWGN			

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

The UE shall start to transmit the PRACH to Cell 2 less than 2240 ms from the beginning of time period T2.

The rate of correct RRC connection release redirection to NR observed during repeated tests shall be at least 90%.

NOTE: The redirection delay can be expressed as:

$$T_{connection\_release\_redirect\_NR} = T_{RRC\_procedure\_delay} + T_{identify-NR} + T_{SI-NR} + T_{RACH},$$

where:

$T_{RRC\_procedure\_delay}$ = 110 ms and is specified in clause 12 in TS 38.331 [13].

$T_{identify-NR}$ = 680 ms in the test.

T_{SI-NR} = 1280 ms is assumed, it is the time required for receiving all the relevant system information as defined in TS 38.331 for the target NR cell.

T_{RACH} = 170 ms in the test.

This gives a total of 2240 ms.

6.3.2.3.2 NR SA FR1 – E-UTRA RRC connection release with redirection

6.3.2.3.2.1 Test purpose

This test is to verify RRC connection release with redirection from NR to E-UTRAN.

6.3.2.3.2.2 Test applicability

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

6.3.2.3.2.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 6.3.2.3.0.2.

The normative reference for this requirement is TS 38.133 [6] A.6.3.2.3.2.

6.3.2.3.2.4 Test description

6.3.2.3.2.4.1 Initial conditions

This test can be run in the configurations defined in Table 6.3.2.3.2.4.1-1.

Table 6.3.2.3.2.4.1-1: Redirection from NR to E-UTRAN test configurations

Configuration	Description
6.3.2.3.2-1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode, LTE FDD
6.3.2.3.2-2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode, LTE FDD
6.3.2.3.2-3	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode, LTE FDD
6.3.2.3.2-4	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode, LTE TDD
6.3.2.3.2-5	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode, LTE TDD
6.3.2.3.2-6	NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode, LTE TDD

Note:	The UE is only required to be tested in one of the supported test configurations

Configure the test equipment and the DUT according to the parameters in Table 6.3.2.3.2.4.1-2.

Table 6.3.2.3.2.4.1-2: Initial conditions for Redirection from NR to E-UTRAN test 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 6.3.2.3.2.4.1-1.		
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 parameters settings are given in Table 6.3.2.3.2.4.1-3 below.

2. Message contents are defined in clause 6.3.2.3.2.4.3.

3. There are two cells specified in the test. Cell 1 is the NR PCell and Cell 2 is the E-UTRAN neighbour cell. Cell 1 is configured according to Annex C.1.1 and C.1.2, Cell 2 is configured according to TS 36.521-3 [26] Annex C.1.0 and C.1.1.

Table 6.3.2.3.2.4.1-3: General test parameters for Redirection from NR to E-UTRAN test case

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
Filter coefficient			0	L3 filtering is not used
Access Barring Information		-	Not Sent	No additional delays in random access procedure.
Time offset between cells			3 µs	Synchronous cells
T1		s	5	
T2		s	2.3	

6.3.2.3.2.4.2 Test procedure

The test consists of two successive time periods, with time duration of T1, and T2 respectively. The "*RRCRelease*" message shall be sent to the UE during period T1 and the start of T2 is the instant when the last TTI containing the RRC message is sent to the UE. Prior to time duration T2, the UE shall not have any timing information of Cell 2. Cell 2 is powered up at the beginning of the T2.

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. Cell 1 is the active cell.

2. Set the parameters according to T1 in Table 6.3.2.3.2.5-1 and 6.3.2.3.2.5-2. T1 starts.

3. SS shall transmit an *RRCRelease* during period T1.

4. The SS shall start T2 timer when the last TTI containing the *RRCRelease* message is sent to UE.

5. When T2 starts, the SS shall switch the power setting from T1 to T2 as specified in Table 6.3.2.3.2.5-1 for Cell 1 and Table 6.3.2.3.2.5-2 for Cell 2.

6. The UE shall transmit RRCConnectionRequest message.

7. If the UE transmits the PRACH to Cell 2 less than 2205 ms from the beginning of time period T2 then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.

8. After T2 expires, the UE shall be switched off. 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 and Cell 2 shall be powered OFF.

9. The SS shall 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.

6.3.2.3.2.4.3   Message contents

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

Table 6.3.2.3.2.4.3-1: RRCRelease for Inter-RAT RRC redirection

Derivation Path: TS 38.508-1 [14], Table 4.6.1-16			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCRelease ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcRelease SEQUENCE {			
redirectedCarrierInfo CHOICE {			
eutra SEQUENCE {			
eutraFrequency	ARFCN-ValueEUTRA	Frequency of Cell 2	
cnType	epc		
}			
}			
}			
}			
}			

6.3.2.3.2.5   Test requirement

Table 6.3.2.3.2.5-1 and 6.3.2.3.2.5-2 define the primary level settings for Redirection from NR to E-UTRAN test case.

Table 6.3.2.3.2.5-1: Cell specific test parameters for Redirection from NR to E-UTRAN test case(Cell 1)

Parameter		Unit	Cell 1	
			T1	T2
RF Channel Number			1	
Duplex mode	Config 1,4		FDD	
	Config 2,3,5,6		TDD	
SSB Configuration	Config 1		SSB.1 FR1	
	Config 2		SSB.1 FR1	
	Config 3		SSB.2 FR1	
CSI-RS for tracking	Config 1		TRS.1.1 FDD	
	Config 2		TRS.1.1 TDD	
	Config 3		TRS.1.2 TDD	
TDD configuration	Config 1,4		Not Applicable	
	Config 2,5		TDDConf.1.1	
	Config 3,6		TDDConf.2.1	
BW$_{channel}$	Config 1,4		10: N$_{RB,c}$ = 52	
	Config 2,5	MHz	10: N$_{RB,c}$ = 52	
	Config 3,6		40: N$_{RB,c}$ = 106	
BWP BW	Config 1,4		10: N$_{RB,c}$ = 52	
	Config 2,5	MHz	10: N$_{RB,c}$ = 52	
	Config 3,6		40: N$_{RB,c}$ = 106	
DRx Cycle		ms	Not Applicable	
PDSCH Reference measurement channel	Config 1,4		SR.1.1 FDD	
	Config 2,5		SR.1.1 TDD	
	Config 3,6		SR2.1 TDD	
CORESET Reference Channel	Config 1,4		CR.1.1 FDD	
	Config 2,5		CR.1.1 TDD	
	Config 3,6		CR2.1 TDD	
OCNG Patterns			OCNG pattern 1	
SMTC configuration	Config 1,2,4,5		SMTC.1 FR1	

Parameter		Unit	Cell 1	
			T1	**T2**
	Config 3,6		SMTC.2 FR1	
PDSCH/PDCCH subcarrier spacing	Config 1,2,4,5	kHz	15 kHz	
	Config 3,6		30 kHz	
PUCCH/PUSCH subcarrier spacing	Config 1,2,4,5	kHz	15 kHz	
	Config 3,6		30 kHz	
PRACH configuration			FR1 PRACH configuration 1	
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	
EPRE ratio of PBCH DMRS to SSS				
EPRE ratio of PBCH to PBCH DMRS				
EPRE ratio of PDCCH DMRS to SSS				
EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE ratio of OCNG DMRS to SSS(Note 1)				
EPRE ratio of OCNG to OCNG DMRS (Note 1)				
N_{oc} Note2		dBm/15kHz	-98	
N_{oc} Note2	Config 1,2,4,5	dBm/SCS	-98	
	Config 3,6		-95	
$\hat{E}_s/I_{ot}$		dB	4	4
$\hat{E}_s/N_{oc}$		dB	4	4
Io Note3	Config 1,2,4,5	dBm/ 9.36MHz	-64.59	-64.59
	Config 3,6	dBm/ 38.16MHz	-58.49	-58.49
Propagation condition		-	AWGN	
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.				
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.				
Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.				

Table 6.3.2.3.2.5-1: Cell specific test parameters for Redirection from NR to E-UTRAN test case(Cell 2)

Parameter	Unit	Configuration	Cell 2	
			T1	**T2**
RF channel number		1, 2, 3, 4, 5, 6	2	
Duplex mode		1, 2, 3	FDD	
		4, 5, 6	TDD	
TDD special subframe configuration[Note1]		4, 5, 6	6	
TDD uplink-downlink configuration[Note1]		4, 5, 6	1	
BW_channel	MHz	1, 2, 3, 4, 5, 6	5MHz: $N_{RB,c}$ = 25 10MHz: $N_{RB,c}$ = 50 20MHz: $N_{RB,c}$ = 100	
PRACH Configuration[Note2]		1, 2, 3	4	
		4, 5, 6	53	
PDSCH parameters: DL Reference Measurement Channel[Note3]		1, 2, 3	5MHz: R.7 FDD 10MHz: R.3 FDD 20MHz: R.6 FDD	
		4, 5, 6	5MHz: R.4 TDD 10MHz: R.0 TDD 20MHz: R.3 TDD	
		1, 2, 3	5MHz: R.11 FDD	

Parameter	Unit	Configuration	Cell 2	
			T1	T2
PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel[Note3]			10MHz: R.6 FDD 20MHz: R.10 FDD	
		4, 5, 6	5MHz: R.11 TDD 10MHz: R.6 TDD 20MHz: R.10 TDD	
OCNG Patterns[Note3]		1, 2, 3	5MHz: OP.20 FDD 10MHz: OP.10 FDD 20MHz: OP.17 FDD	
		4, 5, 6	5MHz: OP.9 TDD 10MHz: OP.1 TDD 20MHz: OP.7 TDD	
PBCH_RA		1, 2, 3, 4, 5, 6		
PBCH_RB				
PSS_RA				
SSS_RA				
PCFICH_RB				
PHICH_RA				
PHICH_RB	dB		0	
PDCCH_RA				
PDCCH_RB				
PDSCH_RA				
PDSCH_RB				
OCNG_RA[Note4]				
OCNG_RB[Note4]				
N_{oc}[Note5]	dBm/15kHz	1, 2, 3, 4, 5, 6	-98	
$\hat{E}_s/N_{oc}$	dB	1, 2, 3, 4, 5, 6	-Infinity	4
$\hat{E}_s/I_{ot}$[Note6]	dB	1, 2, 3, 4, 5, 6	-Infinity	4
RSRP[Note6]	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-94
SCH_RP[Note6]	dBm/15kHz	1, 2, 3, 4, 5, 6	-Infinity	-94
Io[Note6]	dBm/9MHz	1, 2, 3, 4, 5, 6	-70.22	-64.76
Propagation Condition		1, 2, 3, 4, 5, 6	AWGN	
Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211.				
Note 2: PRACH configurations are specified in table 5.7.1-2 and table 5.7.1-3 in TS 36.211.				
Note 3: DL RMCs and OCNG patterns are specified in sections A 3.1 and A 3.2 of TS 36.133 respectively.				
Note 4: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.				
Note 5: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.				
Note 6: $\hat{E}_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.				
Note 7: Propagation condition and correlation matrix are defined in section B.2 in TS 36.101 [27].				

The UE shall start to transmit the PRACH to Cell 2 less than 2205 ms from the beginning of time period T2.

The rate of correct RRC connection release redirection to E-UTRAN observed during repeated tests shall be at least 90%.

NOTE: The redirection delay can be expressed as:

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

where:

$T_{RRC\_procedure\_delay} = 110$ ms and is specified in clause 12 in TS 38.331 [2].

$T_{identify\text{-}E\text{-}UTRA} = 800$ ms in the test.

$T_{SI\text{-}E\text{-}UTRA} = 1280$ ms is assumed, it is the time required for receiving all the relevant system information as defined in TS 38.331 for the target E-UTRAN cell.

$T_{RACH} = 15$ ms in the test.

This gives a total of 2205 ms.

6.3.3   Conditional handover

6.3.3.0   Minimum conformance requirements

6.3.3.0.1   Minimum conformance requirements for NR FR1 intra-frequency conditional handover

[TS 38.133, clause 6.1.4.2.1]

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 6.1.4.2.2.

$T_{CHO\_execution}$ is the conditional execution preparation time in TS 38.133 [6] clause 6.1.4.2.3.

$T_{interrupt}$ is the interruption time stated in TS 38.133 [6] clause 6.1.4.2.4.

[TS 38.133, clause 6.1.4.2.2]

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 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 6.1.4.2.3]

$T_{CHO\_execution}$ 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 6.1.4.2.4]

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 9.2.2]

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 10.1.2 for FR1, 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.

$$T_{identify\_intra\_without\_index} = (T_{PSS/SSS\_sync\_intra} + T_{SSB\_measurement\_period\_intra})\ ms$$

$$T_{identify\_intra\_with\_index} = (T_{PSS/SSS\_sync\_intra} + T_{SSB\_measurement\_period\_intra} + T_{SSB\_time\_index\_intra})\ ms$$

Where:

T_{PSS/SSS_sync_intra}: it is the time period used in PSS/SSS detection given in TS 38.133 [6] Table 9.2.5.1-1.

$T_{SSB\_time\_index\_intra}$: it is the time period used to acquire the index of the SSB being measured given in TS 38.133 [6] Table 9.2.5.1-3.

$T_{SSB\_measurement\_period\_intra}$: equal to a measurement period of SSB based measurement given in TS 38.133[6] Table 9.2.5.2-1.

$CSSF_{intra}$: 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, i.e. when intra-frequency SMTC is fully non overlapping or partially overlapping with measurement gaps.

When intra-frequency SMTC is fully non overlapping with measurement gaps or intra-frequency SMTC is fully overlapping with MGs, Kp=1

Table 9.2.5.1-1: Time period for PSS/SSS detection, (Frequency range FR1)

DRX cycle	T_{PSS/SSS_sync_intra}
No DRX	max(600ms, ceil(5 x K_p) x SMTC period)[Note 1] x $CSSF_{intra}$
DRX cycle≤ 320ms	max(600ms, ceil(M2 [Note 2] x 5 x K_p) x max(SMTC period,DRX cycle)) x $CSSF_{intra}$
DRX cycle>320ms	ceil(5 x K_p) x DRX cycle x $CSSF_{intra}$
NOTE 1:	If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified
NOTE 2:	When *highSpeedMeasFlag-r16* is not configured, M2 = 1.5; When *highSpeedMeasFlag-r16* is configured, M2 = 1.5 if SMTC periodicity > 40 ms;,otherwise M2=1.
NOTE 3:	When *highSpeedMeasFlag-r16* is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *[intraRAT-MeasurementEnhancement-r16]* on measurements of the primary component carrier and do not apply to measurements of a secondary component carrier with active SCell.

Table 9.2.5.1-3: Time period for time index detection (FR1)

DRX cycle	$T_{SSB\_time\_index\_intra}$
No DRX	max(120ms, ceil(3 x K_p) x SMTC period)[Note 1] x $CSSF_{intra}$
DRX cycle≤ 320ms	max(120ms, ceil (M2 [Note 2] x 3 x K_p) x max(SMTC period,DRX cycle)) x $CSSF_{intra}$
DRX cycle>320ms	Ceil(3 x K_p) x DRX cycle x $CSSF_{intra}$
NOTE 1:	If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified
NOTE 2:	When *highSpeedMeasFlag-r16* is not configured, M2 = 1.5; When *highSpeedMeasFlag-r16* is configured, M2 = 1.5 if SMTC periodicity > 40 ms;,otherwise M2=1
NOTE 3:	When *highSpeedMeasFlag-r16* is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *[intraRAT-MeasurementEnhancement-r16]* on measurements of the primary component carrier and do not apply to measurements of a secondary component carrier with active SCell.

[TS 38.133, clause 9.2.5.2]

The measurement period for intra-frequency measurements without gaps is as shown in TS 38.133 [6] Table 9.2.5.2-1.

Table 9.2.5.2-1: Measurement period for intra-frequency measurements without gaps(FR1)

DRX cycle	$T_{SSB\_measurement\_period\_intra}$
No DRX	max(200ms, ceil(5 x K_p) x SMTC period)[Note 1] x $CSSF_{intra}$
DRX cycle≤ 320ms	max(200ms, ceil(1.5x 5 x K_p) x max(SMTC period,DRX cycle)) x $CSSF_{intra}$
DRX cycle>320ms	ceil(5 x K_p) x DRX cycle x $CSSF_{intra}$
NOTE 1:	If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified

[TS 38.133, clause 10.1.2.1.1]

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 FR1. The accuracy requirements in this clause are also applicable when *highSpeedMeasFlag-r16* is configured.

The accuracy requirements in TS 38.133 [6] Table 10.1.2.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] for reference sensitivity are fulfilled.

- Conditions for intra-frequency measurements are fulfilled according to 38.133 [6] Annex B.2.2 for a corresponding Band for each relevant SSB.

Table 10.1.2.1.1-1: SS-RSRP Intra frequency absolute accuracy in FR1

Accuracy			Conditions				
Normal condition	Extreme condition	SSB Ês/Iot	Io Note 1 range				
			NR operating band groups Note 2	Minimum Io			Maximum Io
dB	dB	dB		dBm / SCS$_{SSB}$		dBm/BW$_{Channel}$	dBm/BW$_{Channel}$
				SCS$_{SSB}$ = 15 kHz	SCS$_{SSB}$ = 30 kHz		
±4.5	±9	≥-6	Depending on band group	-121+ Δ_{BG_offset}	-118+ Δ_{BG_offset}	N/A	-70
±8	±11	≥-6	Depending on band group	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.							
NOTE 3: For NR operating band groups, Δ_{BG_offset} is defined in clause 3A.4, Table 3A.4.1-2.							

[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 Table B.2.2-1 for FR1 NR cells.

Table B.2.2-1: Conditions for intra-frequency measurements in FR1

Parameter	NR operating band groups Note1	Minimum SSB_RP		SSB Ês/Iot
		dBm / SCS$_{SSB}$		
		SCS$_{SSB}$ = 15 kHz	SCS$_{SSB}$ = 30 kHz	dB
Conditions	Depending on band group	-127+ Δ_{BG_offset}	-124+ Δ_{BG_offset}	≥ -6
NOTE 1: NR operating band groups are defined in clause 3.5.2.				
NOTE 2: For NR operating band groups, Δ_{BG_offset} is defined in clause 3A.4, Table 3A.4.1-2.				

6.3.3.0.2   Minimum conformance requirements for NR FR1 inter-frequency conditional handover

[TS 38.133, clause 6.1.4.2.1]

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 6.1.4.2.2.

$T_{CHO\_execution}$ is the conditional execution preparation time in TS 38.133 [6] clause 6.1.4.2.3.

$T_{interrupt}$ is the interruption time stated in TS 38.133 [6] clause 6.1.4.2.4.

[TS 38.133, clause 6.1.4.2.2]

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 clause 9.2.5.1 or clause 9.2.6.2.

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

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 6.1.4.2.3]

$T_{CHO\_execution}$ 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 6.1.4.2.4]

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 9.3.2]

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 10.1.4 for FR1, 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 $T_{identify\_inter\_without\_index}$.

$$T_{identify\_inter\_without\_index} = (T_{PSS/SSS\_sync\_inter} + T_{SSB\_measurement\_period\_inter})\ \text{ms}$$

$$T_{identify\_inter\_with\_index} = (T_{PSS/SSS\_sync\_inter} + T_{SSB\_measurement\_period\_inter} + T_{SSB\_time\_index\_inter})\ \text{ms}$$

Where:

T_{PSS/SSS_sync_inter}: it is the time period used in PSS/SSS detection given in 38.133 [6] Table 9.3.4-1.

$T_{SSB\_time\_index\_inter}$: it is the time period used to acquire the index of the SSB being measured given in 38.133 [6] Table 9.3.4-3.

$T_{SSB\_measurement\_period\_inter}$: equal to a measurement period of SSB based measurement given in 38.133 [6] Table 9.3.5-1.

$CSSF_{inter}$: it is a carrier specific scaling factor and is determined according to $CSSF_{within\_gap,i}$ in 38.133 [6] clause 9.1.5.2 for measurement conducted within measurement gaps.

Table 9.3.4-1: Time period for PSS/SSS detection (Frequency range FR1)

Condition [NOTE1,2]	T_{PSS/SSS_sync_inter}
No DRX	Max(600ms, 8 × Max(MGRP, SMTC period)) × $CSSF_{inter}$
DRX cycle ≤ 320ms	Max(600ms, Ceil(8*1.5) × Max(MGRP, SMTC period, DRX cycle)) × $CSSF_{inter}$
DRX cycle > 320ms	8 × 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 9.3.4-3: Time period for time index detection (Frequency range FR1)

Condition [NOTE1,2]	$T_{SSB\_time\_index\_inter}$
No DRX	Max(120ms, 3 × Max(MGRP, SMTC period)) × $CSSF_{inter}$
DRX cycle ≤ 320ms	Max(120ms, Ceil(3 × 1.5) × Max(MGRP, SMTC period, DRX cycle)) × $CSSF_{inter}$
DRX cycle > 320ms	3 × 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 table 9.3.5-1 and 9.3.5-2:

Table 9.3.5-1: Measurement period for inter-frequency measurements with gaps (Frequency FR1)

Condition [NOTE1,2]	$T_{SSB\_measurement\_period\_inter}$
No DRX	Max(200ms, 8 × Max(MGRP, SMTC period)) × $CSSF_{inter}$
DRX cycle ≤ 320ms	Max(200ms, Ceil(8 × 1.5) × Max(MGRP, SMTC period, DRX cycle)) × $CSSF_{inter}$
DRX cycle > 320ms	8 × 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 10.1.4.1.1]

The requirements for absolute accuracy of SS-RSRP in this clause apply to a cell on a frequency in FR1 that has different carrier frequency from the serving cell.

The accuracy requirements in Table 10.1.4.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-1 [2] 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.

Table 10.1.4.1.1-1: SS-RSRP Inter frequency Absolute accuracy in FR1

Accuracy			Conditions				
Normal condition	**Extreme condition**	**SSB Ês/Iot** Note 2	I_o Note 1 range				
			NR operating band groups Note 3	**Minimum Io**			**Maximum Io**
dB	**dB**	**dB**		**dBm / SCS$_{SSB}$**		**dBm/BW$_{Channel}$**	**dBm/BW$_{Channel}$**
				SCS$_{SSB}$ = 15 kHz	**SCS$_{SSB}$ = 30 kHz**		
±4.5	±9	≥-6	Depending on band group	-121+ Δ_{BG_offset}	-118+ Δ_{BG_offset}	N/A	-70
±8	±11	≥-6	Depending on band group	N/A	N/A	-70	-50
NOTE 1: Io is assumed to have constant EPRE across the bandwidth.							
NOTE 2: Void							
NOTE 3: NR operating band groups in FR1 are as defined in clause 3.5.2.							
NOTE 4: For NR operating band groups, Δ_{BG_offset} is defined in clause 3A.4, Table 3A.4.1-2.							

[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.2.3-1 for FR1 NR cells.

Table B.2.3-1: Conditions for inter-frequency measurements in FR1

Parameter	NR operating band groups Note1	Minimum SSB_RP		SSB Ês/Iot
		dBm / SCS$_{SSB}$		dB
		SCS$_{SSB}$ = 15 kHz	SCS$_{SSB}$ = 30 kHz	
Conditions	Depending on band group	-125+ Δ_{BG_offset}	-122+ Δ_{BG_offset}	≥ -4
NOTE 1: NR operating band groups are defined in clause 3.5.2.				
NOTE 2: For NR operating band groups, Δ_{BG_offset} is defined in clause 3A.4, Table 3A.4.1-2.				

6.3.3.1 NR SA FR1 conditional handover

6.3.3.1.1 Test purpose

To verify the requirement for the NR FR1 intra-frequency conditional handover requirements specified in 38.133 [6] clause 6.1.4.2

6.3.3.1.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and supporting conditional handover.

6.3.3.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.3.1.

6.3.3.1.4   Test description

6.3.3.1.4.1   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 6.3.3.1.4.1-1.

Table 6.3.3.1.4.1-1: NR SA FR1 conditional handover test configurations

Config	Description
6.3.3.1-1	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
	Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.3.3.1-2	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
	Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6.3.3.1-3	Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
	Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note:	The UE is only required to be tested in one of the supported test configurations

Configure the test equipment and the DUT according to the parameters in Table 6.3.3.1.4.1-2

Table 6.3.3.1.4.1-2: Initial conditions for NR SA FR1 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.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 6.3.3.1.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 6.3.3.1.4.3.

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 FR1 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 6.3.3.1.4.1-3 below, with A3-Offset modified by Test Tolerance.

Table 6.3.3.1.4.1-3: General test parameters NR SA FR1 conditional handover

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	
A3-Offset in condition		dB	-1	
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.
PRACH configuration index			FR1 PRACH configuration 1	As specified in table Table 6.3.3.2-3 in TS 38.211 [7]
Time offset between cells			3 μs	Synchronous cells
T1		s	5	
T2		s	$\leq$2	

6.3.3.1.4.2 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 6.3.3.1.4.1-3 and 6.3.3.1.5-1 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

- $T_{RRC} = 10$ms, 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 6.3.3.1.5-1. 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 6.3.3.1.5-1. 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

      - $X = T_{interrupt} + k_1$ for test configuration 6.3.3.1-1

      - $X = T_{interrupt}$ for test configuration 6.3.3.1-2

      - $X = 2 \cdot T_{interrupt}$ for test configuration 6.3.3.1-3.

   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.

6.3.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:Table 6.3.3.1.4.3-1: RRCReconfiguration (Step 4)

Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS and CHO			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration SEQUENCE {			
measConfig	MeasConfig	Table 6.3.3.1.4.3-2	
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
conditionalReconfiguration-r16	ConditionalReconfiguration	Table 6.3.3.1.4.3-5	
}			
}			
}			
}			
}			
}			
}			

Table 6.3.3.1.4.3-2: MeasConfig (Table 6.3.3.1.4.3-1)

Derivation Path: Table H.3.1-2			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasConfig ::= SEQUENCE {			
measObjectToAddModList SEQUENCE (SIZE (1..maxNrofObjectId)) OF MeasObjectToAddMod {	1 entry		
MeasObjectToAddMod[1] SEQUENCE {		entry 1	
measObjectId	1		
measObject CHOICE {			
measObjectNR	MeasObjectNR	Table 6.3.3.1.4.3-3	
}			
}			
}			
reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod {	1 entry		
ReportConfigToAddMod[1] SEQUENCE {		entry 1	
reportConfigId	1		
reportConfig CHOICE {			
reportConfigNR	ReportConfigNR	Table 6.3.3.1.4.3-4	
}			
}			
}			
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 6.3.3.1.4.3-3: MeasObjectNR (Table 6.3.3.1.4.3-2)

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 6.3.3.1.4.3-4: ReportConfigNR (Table 6.3.3.1.4.3-2)

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	-2	actuall value = -2*0.5 = -1dB	
}			
hysteresis	0	actuall value = 0*0.5 = 0dB	
timeToTrigger	ms0		
}			
}			
}			
}			
}			

Table 6.3.3.1.4.3-5: ConditionalReconfiguration (Table 6.3.3.1.4.3-1)

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 6.3.3.1.4.3-2	
}			
condRRCReconfig-r16	OCTET STRING (CONTAINING RRCReconfiguration Specified in Table 4.8.1-1A with condition RBConfig_NoKeyChange)		
}			
}			
}			

6.3.3.1.5   Test requirements

Table 6.3.3.1.5-1 defines the primary level settings including test tolerances for all tests.

Table 6.3.3.1.5-1: Cell specific test parameters for NR SA FR1 conditional handover

Parameter		Unit	Cell 1		Cell 2	
			T1	T2	T1	T2
NR RF Channel Number			1		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			
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			
TRS configuration	Config 1		TRS.1.1 FDD			
	Config 2		TRS.1.1 TDD			
	Config 3		TRS.1.2 TDD			
OCNG Patterns			OCNG pattern 1			
SMTC Configuration			SMTC pattern 1			
SSB Configuration	Config 1,2		SSB.1 FR1			
	Config 3		SSB.2 FR1			
PDSCH/PDCCH subcarrier spacing	Config 1,2	kHz	15 kHz			
	Config 3		30 kHz			

Parameter		Unit	Cell 1		Cell 2	
			T1	T2	T1	T2
PUCCH/PUSCH subcarrier spacing	Config 1,2	kHz	15 kHz			
	Config 3		30 kHz			
PRACH configuration			FR1 PRACH configuration 1			
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			
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
N_{oc} Note2		dBm/15kHz	-98			
N_{oc} Note2	Config 1,2	dBm/SCS	-98			
	Config 3		-95			
$\hat{E}_s / I_{ot}$		dB	8	-2.41	-Infinity	1.36
$\hat{E}_s / N_{oc}$		dB	8	8	-Infinity	10
SSB_RP	Config 1,2	dBm/SCS	-90	-90	-Infinity	-88
	Config 3	dBm/SCS	-87	-87	-Infinity	-85
Io Note3	Config 1,2	dBm/ 9.36MHz	-61.41	-57.67	-61.41	-57.67
	Config 3	dBm/ 38.16MHz	-55.31	-50.56	-55.31	-50.56
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.						

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:

- $T_{measure}$ = 800 ms, 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_Δ = 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 872 ms

The interruption during T2 shall not exceeed $T_{interrupt}$ = 62ms.

6.3.3.2 NR SA FR1-FR1 conditional handover

6.3.3.2.1 Test purpose

To verify the requirement for the NR conditional FR1-NR FR1 inter-frequency conditional handover requirements specified in clause 6.1.4.2.

6.3.3.2.2 Test applicability

This test applies to all types of NR UE from Release 16 onwards and supporting conditional handover.

6.3.3.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.3.3.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.3.3.2.

6.3.3.2.4 Test description

6.3.3.2.4.1 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 6.3.3.2.4.1-1.

Table 6.3.3.2.4.1-1: NR SA FR1-FR1 conditional handover test configurations

Config	Description
6.3.3.2-1	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
	Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.3.3.2-2	Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
	Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6.3.3.2-3	Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
	Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note:	The UE is only required to be tested in one of the supported test configurations

Configure the test equipment and the DUT according to the parameters in Table 6.3.3.2.4.1-2

Table 6.3.3.2.4.1-2: Initial conditions for NR SA FR1-FR1 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.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 6.3.3.2.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection Diagram	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.
	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

1. Message contents are defined in clause 6.3.3.2.4.3.

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 FR1 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 6.3.3.2.4.1-3 below, with A3-Offset modified by Test Tolerance.

Table 6.3.3.2.4.1-3: General test parameters NR SA FR1-FR1 conditional handover

Parameter		Unit	Value	Comment
Initial conditions	Active cell		Cell 1	
	Neighbouring cell		Cell 2	
Final condition	Active cell		Cell 2	

A3-Offset in handover condition	dB	-4	
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.
T1	s	5	
T2	s	≤2	

6.3.3.2.4.2 Test procedure

The test scenario comprises of 2 NR carrier 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 6.3.3.2.4.1-3 and 6.3.3.2.5-1 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 6.3.3.2.5-1. 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 6.3.3.2.5-1. 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

      - $X = T_{interrupt} + k_1$ for test configuration 6.3.3.2-1

      - $X = T_{interrupt}$ for test configuration 6.3.3.2-2

      - $X = 2 \cdot T_{interrupt}$ for test configuration 6.3.3.2-3.

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.

6.3.3.2.4.3 Message contents

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

Table 6.3.3.2.4.3-1: RRCReconfiguration (Step 4)

Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS and CHO			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration SEQUENCE {			
measConfig	MeasConfig	Table 6.3.3.2.4.3-2	
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
conditionalReconfiguration-r16	ConditionalReconfiguration	Table 6.3.3.2.4.3-6	
}			
}			
}			
}			
}			
}			
}			

Table 6.3.3.2.4.3-2: MeasConfig (Table 6.3.3.2.4.3-1)

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 6.3.3.2.4.3-3	
}			
}			
MeasObjectToAddMod[2] SEQUENCE {		entry 2	
measObjectId	2		
measObject CHOICE {			
measObjectNR	MeasObjectNR-f2	Table 6.3.3.2.4.3-4	
}			
}			
}			
reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod {	1 entry		
ReportConfigToAddMod[1] SEQUENCE {		entry 1	
reportConfigId	1		
reportConfig CHOICE {			
reportConfigNR	ReportConfigNR	Table 6.3.3.2.4.3-5	
}			
}			
}			
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 6.3.3.2.4.3-3: MeasObjectNR-f1 (Table 6.3.3.2.4.3-2)

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 6.3.3.2.4.3-4: MeasObjectNR-f2 (Table 6.3.3.2.4.3-2)

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 6.3.3.2.4.3-5: ReportConfigNR (Table 6.3.3.2.4.3-2)

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	-8	actuall value = -8*0.5 = -4dB	
}			
hysteresis	0	actuall value = 0*0.5 = 0dB	
timeToTrigger	ms0		
}			
}			
}			
}			
}			

Table 6.3.3.2.4.3-6: ConditionalReconfiguration (Table 6.3.3.2.4.3-1)

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 6.3.3.2.4.3-2	
}			
condRRCReconfig-r16	OCTET STRING (CONTAINING RRCReconfiguration Specified in Table 4.8.1-1A with condition RBConfig_NoKeyChange)		
}			
}			
}			

6.3.3.2.5 Test requirements

Table 6.3.3.2.5-1 defines the primary level settings including test tolerances for all tests.

Table 6.3.3.2.5-1: Cell specific test parameters for NR SA FR1-FR1 conditional handover

Parameter		Unit	Cell 1		Cell 2	
			T1	T2	T1	T2
NR RF Channel Number			1		2	
Duplex mode	Config 1		FDD			
	Config 2,3		TDD			
TDD configuration	Config 1		Not Applicable			
	Config 2		TDDConf.1.1			
	Config 3		TDDConf.2.1			
BW$_{channel}$	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			
Gap pattern ID			gp0			
PDSCH Reference measurement channel	Config 1		SR.1.1 FDD			
	Config 2		SR.1.1 TDD			
	Config 3		SR2.1 TDD			
CORESET Reference Channel	Config 1		CR.1.1 FDD			
	Config 2		CR.1.1 TDD			
	Config 3		CR2.1 TDD			
OCNG Patterns			OCNG pattern 1			
SMTC Configuration			SMTC pattern 1			
SSB Configuration	Config 1,2		SSB.1 FR1			
	Config 3		SSB.2 FR1			

Parameter		Unit	Cell 1		Cell 2	
			T1	T2	T1	T2
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 1			
BWP	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			
EPRE ratio of PBCH DMRS to SSS						
EPRE ratio of PBCH to PBCH DMRS						
EPRE ratio of PDCCH DMRS to SSS						
EPRE ratio of PDCCH to PDCCH DMRS						
EPRE ratio of PDSCH DMRS to SSS						
EPRE ratio of PDSCH to PDSCH						
EPRE ratio of OCNG DMRS to SSS(Note 1)						
EPRE ratio of OCNG to OCNG DMRS (Note 1)						
N_{oc} Note2		dBm/15kHz	-98		-98	
N_{oc} Note2	Config 1,2	dBm/SCS	-98		-98	
	Config 3		-95		-95	
$\hat{E}_s/I_{ot}$		dB	4	4	-Infinity	6.70
$\hat{E}_s/N_{oc}$		dB	4	4	-Infinity	6.70
SSB_RP	Config 1,2	dBm/SCS	-94	-94	-Infinity	-91.30
	Config 3	dBm/SCS	-91	-91	-Infinity	-88.30
Io Note3	Config 1,2	dBm/ 9.36MHz	-64.59	-64.59	-70.05	-62.51
	Config 3	dBm/ 38.16MHz	-58.49	-58.49	-63.94	-56.40
Propagation condition		-	AWGN		AWGN	
Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.						
Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be 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.						

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:

- $T_{measure}$ = 920 ms, 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_Δ + 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_Δ = 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 992 ms

The interruption during T2 shall not exceeed $T_{interrupt} = 62ms$.