**3GPP TSG-RAN4 Meeting #111 *R4-2409388***

**Fukuoka, JP, 20th May – 24th May, 2024**

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.133** | **CR** | **-** | **rev** | **-** | **Current version:** | **18.5.0** |  |
|  | | | | | | | | |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network |  | Core Network |  |

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|  | | | | | | | | | | |
| ***Title:*** | Draft CR to TS 38.133 on performance requirements for R18 LTM | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | MediaTek Inc., Apple, Qualcomm, Nokia, OPPO, Ericsson, Huawei, CATT | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_Mob\_enh2-Perf | | | | |  | ***Date:*** | | | 2024-5-12 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***Release:*** | | | Rel-18 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)  Rel-20 (Release 20)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | 1. Align the title of sections for L1-RSRP accuracy requirements. 2. The definition of relative accuracy requirements in 10.1.20X is not clear. 3. Source RS of UL TCI state indicated in cell switch command can be SSB. 4. In cell switch related test cases,   - The wording “Cell 1 and Cell 2 on radio channel 1 are powered on” is mis-understood as “Cell 1 and Cell 2 are not powered on before T1”  - The procedure “UE establishes a connection with the Cell 1” should be done before T1   1. 50ms may be not enough to finish T/F tracking after early TCI state activation command for inter-f with gap if gap occasion is just after TCI state activation command. UE may miss the first gap occasion. 2. In the test cases for intra-f and inter-f without gap L1 measurement delay, due to sudden and large RSRP changes from T1 and T2 in both serving cell and neighbor cell, if SSB occasion comes immediately after the start of T2, UE may fail to meet the accuracy requirements with one shot measurement as AGC adjustment is not finished. Some limitation on the start occasion of T2 can solve this issue. 3. Some test requirements are not accurate. 4. Some parameters are missing or not accurate 5. There are some typos | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | 1. Align the title of sections for L1-RSRP accuracy requirements. 2. Make the definition of relative accuracy requirements in 10.1.20X clearer. 3. Remove Candidate UL TCI.State.1 in A.3.16B.3 and in some cell switch test cases. 4. Remove the following sentences in cell switch related test cases  * Cell 1 and Cell 2 on radio channel 1 are powered on. * UE establishes a connection with the Cell 1  1. Change “T3 ends 50ms after the candidate cell TCI state activation MAC CE transmission.” to “T3 ends 100ms after the candidate cell TCI state activation MAC CE transmission.” in inter-f cell switch test cases. 2. Some limitation on the state occasion of T2 is added in the test cases for intra-f and inter-f without gap L1 measurement delay. 3. Correct some test requirements 4. Add and correct some parameters 5. Correct the typos | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Accuray requirements and test case for R18 LTM would be not accurate. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | (new)10.1.19X, (new)10.1.19y, (new)10.1.20X, (new)10.1.20Y, (new)A.3.8.2.5, (new)A.3.8.3.5, (new)A.3.16B, (new)A.6.3.x, (new)A.6.3.y, (new)A.6.3.2.x, (new)A.6.6.x, (new)A.6.6.y, (new)A.6.6.z, (new)A.6.7.x, (new)A.7.3.x, (new)A.7.3.x1, (new)A.7.3.2.x, (new)A.7.6.x, (new)A.7.6.Y, (new)A.7.6.Z, (new)A.7.7.x | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **x** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | | **x** |  | Test specifications | | | | TS 38.533 | | |
| ***(show related CRs)*** | |  | **x** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | | The additional changes compared to the one shared before meeting can be found in the Author of CH, Miao Wang and Riikka. | | | | | | | | |

Start of Change 5

#### A.3.8.2.5 FR1 PRACH configuration 5

FR1 PRACH configuration 5 in this clause provides the typical PRACH configuration for LTM early UL synchronization on candidate cell in FR1.

Table A.3.8.2.5-1: Parameters for FR1 PRACH configuration 5

|  |  |  |
| --- | --- | --- |
| Field | Value | Comment |
| prach-ConfigurationIndex | 102 | 10ms PRACH periodicity, and other detailed configuration defined in table 6.3.3.2-2 and table 6.3.3.2-3 in TS 38.211 [6]. |
| msg1-FDM | One | One PRACH transmission occasions FDMed in one time instance. |
| msg1-FrequencyStart | 0 |  |
| zeroCorrelationZoneConfig | 11 | N-CS configuration, NCS = 23 |
| preambleReceivedTargetPower | dBm-120 |  |
| preambleTransMax | n6 |  |
| powerRampingStep | dB2 |  |
| ssb-perRACH-Occasion | oneFourth | OneFourth: 1 SSB associated with 4 RACH occasions |
| prach-RootSequenceIndex | 0 | Logic sequence index = 0, resulting in root sequence = 1. |
| ltm-prach-SubcarrierSpacing | Same as UL carrier SCS |  |
| Note: For further information see clause 6.3.2 in TS 38.331 [2]. | | |

End of Change 5

Start of Change 6

#### A.3.8.3.5 FR2 PRACH configuration 5

FR2 PRACH configuration 5 in this clause provides the typical PRACH configuration for LTM early UL synchronization on candidate cell in FR2.

Table A.3.8.3.5-1: Parameters for FR2 PRACH configuration 5

|  |  |  |
| --- | --- | --- |
| Field | Value | Comment |
| prach-ConfigurationIndex | 190 | Preamble Format C2, with 10ms PRACH periodicity, and other detailed configuration defined in table 6.3.3.2-4 in TS 38.211 [6] |
| msg1-FDM | One | One PRACH transmission occasions FDMed in one time instance. |
| msg1-FrequencyStart | 0 |  |
| zeroCorrelationZoneConfig | 11 | N-CS configuration, NCS = 23 |
| preambleReceivedTargetPower | dBm-120 |  |
| preambleTransMax | n6 |  |
| powerRampingStep | dB2 |  |
| ssb-perRACH-Occasion | oneFourth | OneFourth: 1 SSB associated with 4 RACH occasions |
| prach-RootSequenceIndex | 0 | Logic sequence index = 0, resulting in root sequence = 1. |
| ltm-prach-SubcarrierSpacing | Same as UL carrier SCS |  |
| Note: For further information see clause 6.3.2 in TS 38.331 [2]. | | |

End of Change 6

Start of Change 7

## A.3.16B LTM Candidate TCI State Configuration

### A.3.16B.1 Introduction

This clause provides the configurations for TCI states of LTM candidate cell(s) towards either SSB or TRS. The LTM candidate DLorJoint TCI states defined in this clause are configured in each test when applicable to indicate that certain DL (and UL, if joint DL/UL operation is configured) signals are QCL’ed with the referenceSignal configured in the TCI states. The UL TCI states defined in this clause are configured in each test when applicable to indicate that certain UL signals are QCL’ed with the referenceSignal configured in the TCI states.

### A.3.16B.2 LTM candidate DLorJoint TCI states

Table A.3.16B.2-1: LTM candidate DLorJoint TCI States

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Candidate DLorJoint TCI.State.0 | Candidate DLorJoint TCI.State.1 | Candidate DLorJoint TCI.State.2 | Candidate DLorJoint TCI.State.3 |
| Candidatetci-StateId | Id0 | Id1 | Id2 | Id3 |
| qcl-Type1 | typeA | typeA | typeA | typeA |
| referenceSignal of qcl-Type 1 Note2 | SSB0 | Resource #4 in TRS resource set 1 Note3 | SSB0 | Resource #4 in TRS resource set 1 Note3 |
| qcl-Type2Note1 | typeD | typeD | typeD | typeD |
| referenceSignal of qcl-Type2 Note2 | SSB0 | Resource #4 in TRS resource set 1 Note3 | SSB0 | Resource #4 in TRS resource set 1 Note3 |
| pathlossReferenceRS | SSB0 | SSB0 | N/A | N/A |
| additionalPCI | N/A | N/A | N/A | N/A |
| Note 1: qcl-Type2 of typeD only where applicable. For RRM test cases, this will be only in FR2  Note 2: referenceSignal configurations towards which the TCI states are configured are defined in a test-specific manner.  Note 3: Reference TRS resource sets are defined in A.3.17, and the applicable TRS resource set(s) are specified in each test case. When a single TRS resource set is configured for a candidate cell in a test case, it is considered as resource set 1. The TCI state of the TRS is the CandidateDLorJoint TCI.State.2. | | | | |

### A.3.16B.3 LTM candidate UL TCI states

Table A.3.16B.3-1: LTM candidate UL TCI States

|  |  |  |
| --- | --- | --- |
| Parameter | Candidate UL TCI.State.0 |  |
| Candidateul-TCIState-Id | Id0 |  |
| referenceSignal Note1 | SSB0 |  |
| pathlossReferenceRS | SSB0 |  |
| additionalPCI | N/A |  |
| Note 1: referenceSignal configurations towards which the UL TCI states are configured are defined in a test-specific manner. | | |

End of Change 7

Start of Change 8

#### A.6.3.2.x LTM PDCCH-order Random Access

##### A.6.3.2.x.1 PDCCH-order RACH on neighbor cell in FR1 when RACH BW is within active UL BWP

A.6.3.2.x.1.1 Test Purpose and Environment

This test is to verify the requirement for PDCCH-order RACH on neighbour cell in FR1 when RACH BW is within active UL BWP specified in clause 8.1 in 38.213 [3] and UE transmit timing in clause 7.1 for UE supporting [RACH-based early TA acquisition].

A.6.3.2.x.1.2 Test Parameters

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. Test configurations are given in table A.6.3.2.x.1.2-1. Both PDCCH order RACH delay, transmit timing requirement and the interruption requirements are tested by using the parameters in table A.6.3.2.x.1.2-2, and A.6.3.2.x.1.2-3.

This test contains 3 tests (test 1, 2, and 3) and UE may have to pass one of the tests based on the conditions defined in this clause.

* In test 1, joint TCI state configuration as defined in Table A.6.3.2.x.1.2-2 is provided.
* In test 2, separate TCI state configuration as defined in Table A.6.3.2.x.1.2-2 is provided.
* In test 3, no candidate TCI state configurations are configured as in Table A.6.3.2.x.1.2-2.

If a UE supports *ltm-MAC-CE-JointTCI-r18*, it is only required to pass test 1. If a UE supports *ltm-MAC-CE-SeparateTCI-r18* and does not support *ltm-MAC-CE-JointTCI-r18*, it is only required to pass test 2. If a UE supports neither *ltm-MAC-CE-SeparateTCI-r18* nor *ltm-MAC-CE-JointTCI-r18*, it is only required to pass test 3.

The test consists of two successive time periods, with time durations of T1 and T2 respectively. No gap patterns are configured in the test case.

Prior to the start of the time duration T1,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC).

- UE is provided with *LTM-Candidate-r18* for Cell 2*.*

- A measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

- UE is configured with SSB-based L1-RSRP measurements and periodic L1-RSRP measurement reports on candidate cell (Cell 2) in PUCCH format 2.

- For tests 1, 2, 3, the UE has reported L3 measurement results and performed SSB based L1-RSRP measurement on Cell 2.

In test 1, 2 and 3, T1 starts from UE transmitting a valid L1 report on Cell 2.

In test 1 and test 2, after receiving the first L1 report on Cell 2 during T1, the test equipment sends TCI state activation MAC CE to active TCI state of Cell 2 no later than 100 ms after receiving the L1 report.

* In test 1, CandidateTCI-State#1 is activated.
* In test 2, CandidateTCI-State#1 and CandidateTCI-UL-State#1 are activated.
* In test 3, test equipment shall not send TCI state activation MAC CE to active TCI state of Cell 2.

The start of T2 is the instant when PDCCH order to trigger PRACH transmission on Cell 2 is sent to the UE.

Table A.6.3.2.x.1.2-1: PDCCH order RACH on Neighbor cell in FR1 test configurations

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

Table A.6.3.2.x.1.2-2: General test parameters for PDCCH order RACH in FR1

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | | | Comment |
| Test 1 | Test 2 | Test 3 |
| Initial conditions | Active cell |  | Cell 1 | | |  |
|  | Neighbouring cell |  | Cell 2 | | | Cell 2 is the candidate cell |
| Final condition | Active cell |  | Cell 1 | | | After transmitting PRACH on Cell 2, UE shall be back to Cell 1. |
| A3-Offset | | dB | -6 | | |  |
| Hysteresis | | dB | 0 | | |  |
| Time To Trigger | | ms | 0 | | |  |
| Filter coefficient | |  | 0 | | | L3 filtering is not used |
| DRX | |  | OFF | | | DRX is not used |
| Time offset between cells | |  | 2 μs | | | RTD between cells is less than CP |
| deriveSSB-IndexFromCell | |  | Enabled | | |  |
| EarlyUL-SyncConfig | frequencyInfoUL |  | NR RF Channel Number 1 | | | Same as Cell 1 |
| PRACH configuration |  | FR1 PRACH configuration 5 | | | RACH bandwidth is within active UL BWP of Cell 1 |
| bwp-GenericParameters |  | ULBWP.0.1 | | |
| n-TimingAdvanceOffset | Tc | 25600 | | |  |
| LTM-CSI-ReportConfig | L1-RSRP reporting period | slot | 80 | | | Periodic L1-RSRP reporting configured |
| nrOfReportedCells |  | n1 | | | Report candidate cell’s (Cell 2) L1-RSRP measurement results. |
| nrOfReportedRS-PerCell |  | n1 | | |
|  | spCellInclusion |  | N/A | | |
| ltm-DL-OrJointTCI-StateToAddModList | #1  CandidateTCI-State |  | DlorJoint TCI.State.0 | DlorJoint TCI.State.2 | N/A | As specified in clause A.3.16B.  Configured for early TCI state activation for test 1 and test 2. |
| Ltm-UL-TCI-StatesToAddModList | #1  CandidateTCI-UL-State#0 |  | N/A | UL TCI.State.0 | N/A | As specified in clause A.3.16B.  Configured for early TCI state activation for test 2. |
| Ltm-ConfigComplete | |  | True | | | Candidate cell’s configuration is complete configuration |
| T1 | | s | 0.3 | | |  |
| T2 | | s | ≤0.5 | | |  |

Table A.6.3.2.x.1.2-3: Cell specific test parameters for PDCCH order RACH 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 | | | | |
| BWchannel | | Config 1 | MHz | 10: NRB,c = 52 | | | | |
|  | | Config 2 |  | 10: NRB,c = 52 | | | | |
|  | | Config 3 |  | 40: NRB,c = 106 | | | | |
| BWP BW | | Config 1 | MHz | 10: NRB,c = 52 | | | | |
|  | | Config 2 |  | 10: NRB,c = 52 | | | | |
|  | | Config 3 |  | 40: NRB,c = 106 | | | | |
| PDSCH Reference | | Config 1 |  | SR.1.1 FDD | | N/A | | |
| measurement channel | | Config 2 |  | SR.1.1 TDD | | N/A | | |
|  | | Config 3 |  | SR.2.1 TDD | | N/A | | |
| CORESET Reference Channel | | Config 1 |  | CR.1.1 FDD | | N/A | | |
|  | | Config 2 | CR.1.1 TDD | | N/A | | |
|  | | Config 3 | CR.2.1 TDD | | N/A | | |
| CP length | |  |  | Normal | | | | |
| 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 | | | | |
|  | | Config 3 |  | 30 | | | | |
| PUCCH/PUSCH subcarrier spacing | | Config 1,2 | kHz | 15 | | | | |
|  | | Config 3 |  | 30 | | | | |
| 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) | | |
| Note2 | | | dBm/15kHz | -98 | | | | |
| Note2 | Config 1,2 | | dBm/SCS | -98 | | | | |
|  | Config 3 | |  | -95 | | | | |
|  | | | dB | -0.64 | -0.64 | | -0.64 | -0.64 |
|  | | | dB | 8 | 8 | | 8 | 8 |
| SSB\_RP | Config 1,2 | | dBm/SCS | -90 | -90 | | -90 | -90 |
|  | Config 3 | | dBm/SCS | -87 | -87 | | -87 | -87 |
| IoNote3 | Config 1,2 | | dBm/  9.36MHz | -58.7 | -58.7 | | -58.7 | -58.7 |
|  | Config 3 | | dBm/  38.16MHz | -52.6 | -52.6 | | -52.6 | -52.6 |
| 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  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | |

A.6.3.2.x.1.3 Test Requirements

The UE shall transmit the PRACH preamble to Cell 2 in the first available PRACH occasion after + 0.5ms + from the beginning of time period T2. After transmitting PRACH on Cell 2, UE shall retune back to Cell 1.

NOTE: The PDCCH order RACH delay can be expressed as: , where:

- is a time duration of symbols corresponding to a PUSCH preparation time for UE processing capability 1 assuming corresponds to the smallest SCS configuration between the SCS configuration of the PDCCH order and the SCS configuration of the corresponding PRACH transmission and is specified in Table 6.4-1 in 38.214 [26].

- = 0, = 0, = 0

- = 0.5ms

- = 0 for UE supporting *ltm-MAC-CE-JointTCI-r18* and/or *ltm-MAC-CE-SeparateTCI-r18*, otherwise is [the time to first SSB after the slot that UE receives PDCCH-order].

During T2, interruption on Cell 1 UL shall not happen outside [the overlapped slot to transmit PRACH] and symbols before and after the PRACH occasion as defined in clause 8.1 in 38.213 [3], where N=2. During T2, interruption on Cell 1 DL shall not occur outside the overlapped slot to transmit PRACH.

The test equipment will verify that the timing of PRACH transmission on Cell 2 is within (NTA + NTA\_offset) ×Tc ± Te of the first detected path of DL SSB of Cell 2.

a. The NTA\_offset value (in Tc units) is 25600

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

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

End of Change 8

Start of Change 9

### A.6.3.x LTM PCell Switch

#### A.6.3.x.1 RACH-based Intra-frequency PCell switch from FR1 to FR1

##### A.6.3.x.1.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR1-NR FR1 RACH-based intra frequency PCell switch specified in clause 6.3.1 for both with and without early TCI state activation.

##### A.6.3.x.1.2 Test Parameters

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. Test configurations are given in table A.6.3.x.1.2-1. Both cell switch delay and interruption length are tested by using the parameters in table A.6.3.x.1.2-2, and A.6.3.x.1.2-3.

The test consists of 4 tests, and UE is required to pass one among Test 1A, Test 1B, Test 2A and Test 2B.

- Test 1: for a UE supporting *ltm-MAC-CE-JointTCI-r18 and/or ltm-MAC-CE-SeparateTCI-r18*

- Test 1A: for a UE supporting *ltm-MAC-CE-JointTCI-r18*.

- Test 1B: for a UE supporting *ltm-MAC-CE-SeparateTCI-r18* and does not support *ltm-MAC-CE-JointTCI-r18*.

- Test 2: for a UE not supporting *ltm-MAC-CE-JointTCI-r18 and ltm-MAC-CE-SeparateTCI-r18*

- Test 2A: for a UE supporting *ltm-BeamIndicationJointTCI-r18*.

- Test 2B: for a UE supporting *ltm-BeamIndicationSeparateTCI-r18* and does not support *ltm-BeamIndicationJointTCI-r18*.

The test consists of four successive time periods, with time durations of T1 to T4 respectively. No gap patterns are configured in the test case.

During T1, for Test 1A, 1B, 2A and 2B:

- A measurement object is configured for the frequency of the Cell 2, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

- T1 ends with UE reporting an L3 measurement result of Cell 2 to Cell 1.

During T2, for Test 1A, 1B, 2A and 2B:

- At the start of T2, UE is provided with *LTM-Candidate-r18* for Cell 2

- In Test 1A and Test 2A, joint TCI state configurations as defined in Table A.6.3.x.1.2-2 are provided.

- In Test 1B and Test 2B, separate TCI state configurations as defined in Table A.6.3.x.1.2-2 are provided.

- UE is configured with SSB-based L1-RSRP measurements and periodic L1-RSRP measurement reports on candidate cell (Cell 2) in PUCCH format 2.

- T2 ends with UE reporting a valid L1-RSRP result of Cell 2.

During T3, for Test 1A and 1B:

- At the start of T3, UE receives candidate cell TCI state activation MAC CE for Cell 2.

- In Test 1A, *CandidateTCI-State#1* is activated.

- In Test 1B, *CandidateTCI-State#1* and *CandidateTCI-UL-State#1* is activated.

- T3 ends 50 ms after the candidate cell TCI state activation MAC CE transmission.

- In Test 2A and 2B, T3 is skipped.

During T4, for Test 1A, 1B, 2A and 2B:

- The start of T4 is the last TTI containing LTM cell switch command MAC CE is sent by Cell 1 to the UE.

- In the cell switch command, Cell 2 is the target cell. Contention-Free Random-Access Resources are indicated and the field of Timing Advance Command is set to FFF.

- In test 1A, CandidateTCI-State#2 is indicated.

- In test 1B, CandidateTCI-State#2 and CandidateTCI-UL-State#1 are indicated.

- In test 2A, CandidateTCI-State#1 is indicated.

- In test 2B, CandidateTCI-State#1 and CandidateTCI-UL-State#1 are indicated.

- T4 ends upon the reception of PRACH at Cell 2.

Table A.6.3.x.1.2-1: Intra-frequency cell switch from FR1 to FR1 test configurations

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

Table A.6.3.x.1.2-2: General test parameters for Intra-frequency cell switch from FR1 to FR1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | | | | Comment |
| Test 1A | Test 1B | Test 2A | Test 2B |
| Initial conditions | Active cell |  | Cell 1 | | | |  |
|  | Neighbouring cell |  | Cell 2 | | | | Cell 2 is the candidate cell |
| Final condition | Active cell |  | Cell 2 | | | |  |
| A3-Offset | | dB | -6 | | | |  |
| Hysteresis | | dB | 0 | | | |  |
| Time To Trigger | | s | 0 | | | |  |
| Filter coefficient | |  | 0 | | | | L3 filtering is not used |
| DRX | |  | OFF | | | | DRX is not used |
| Access Barring Information | | - | Not Sent | | | | No additional delays in random access procedure. |
| Time offset between cells | |  | 2 μs | | | | RTD between cells is less than CP |
| deriveSSB-IndexFromCell | |  | Enabled | | | |  |
| LTM-CSI-ReportConfig | L1-RSRP reporting period | slot | 80 | | | | Periodic L1-RSRP reporting configured |
| nrOfReportedCells |  | n1 | | | | Report candidate cell’s (Cell 2) L1-RSRP measurement results. |
| nrOfReportedRS-PerCell |  | n1 | | | |
|  | spCellInclusion |  | N/A | | | |
| ltm-DL-OrJointTCI-StateToAddModList | CandidateTCI-State#1 |  | DLorJoint TCI.State.0 | DLorJoint TCI.State.2 | DLorJoint TCI.State.1 | DLorJoint TCI.State.3 | As specified in clause A.3.16B.  In test 1A and 1B, CandidateTCI-State#1 and/or CandidateTCI-UL-State#1 are configured for early TCI state activation. CandidateTCI-State#2 and/or CandidateTCI-UL-State#1 are configured for TCI state indication in cell switch command.  In test 2A and 2B, CandidateTCI-State#1 and/or CandidateTCI-UL-State#1 are configured for TCI state indication in cell switch command. |
| #2  CandidateTCI-State#2 |  | DLorJoint TCI.State.1 | DLorJoint TCI.State.3 | N/A | N/A |
| ltm-UL-TCI-StatesToAddModList | CandidateTCI-UL-State#1 |  | N/A | UL TCI.State.0 | N/A | UL TCI.State.0 |
|  |  |  |  |  |  |
| ltm-ConfigComplete | |  | True | | | | Candidate cell’s configuration is complete configuration |
| T1 | | s | <3 | | | |  |
| T2 | | s | ≤0.2 | | | |  |
| T3 | | s | ≤0.1 | | | |  |
| T4 | | s | ≤0.1 | | | |  |

Table A.6.3.x.1.2-3: Cell specific test parameters for NR FR1-FR1 Intra frequency cell switch test case

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Cell 1 | | Cell 2 | |
|  | | |  | T1~T4 | | T1~T4 | |
| 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 | | | |
| BWchannel | | Config 1 | MHz | 10: NRB,c = 52 | | | |
|  | | Config 2 |  | 10: NRB,c = 52 | | | |
|  | | Config 3 |  | 40: NRB,c = 106 | | | |
| BWP BW | | Config 1 | MHz | 10: NRB,c = 52 | | | |
|  | | Config 2 |  | 10: NRB,c = 52 | | | |
|  | | Config 3 |  | 40: NRB,c = 106 | | | |
| PDSCH Reference | | Config 1 |  | SR.1.1 FDD | | | |
| measurement channel | | 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 | | | |
| CP length | |  |  | Normal | | | |
| 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 | | | |
|  | | 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) | | |
| Note2 | | | dBm/15kHz | -98 | | | |
| Note2 | Config 1,2 | | dBm/SCS | -98 | | | |
|  | Config 3 | |  | -95 | | | |
|  | | | dB | -0.64 | -0.64 | -0.64 | -0.64 |
|  | | | dB | 8 | 8 | 8 | 8 |
| SSB\_RP | Config 1,2 | | dBm/SCS | -90 | -90 | -90 | -90 |
|  | Config 3 | | dBm/SCS | -87 | -87 | -87 | -87 |
| IoNote3 | Config 1,2 | | dBm/  9.36MHz | -58.7 | -58.7 | -58.7 | -58.7 |
|  | Config 3 | | dBm/  38.16MHz | -52.6 | -52.6 | -52.6 | -52.6 |
| 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  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | |

##### A.6.3.x.2.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 in no later than DLTM from the beginning of time period T4. The rate of correct cell switches observed during repeated tests shall be at least 90%.

NOTE: The cell switch delay can be expressed as DLTM (= Tcmd + TLTM-interrupt), where:

Tcmd = THARQ + 3ms and is specified in clause 6.3.1.2. TLTM-interrupt = TLTM-RRC-processing + TLTM-processing + Tfirst-RS + TRS-proc + TLTM-IU ms and is specified in clause 6.3.1.2.1

- Tfirst-RS + TRS-proc= 0 ms for Test 1A and 1B, Tfirst-RS + TRS-proc= 22 ms for Test 2A and 2B

- TLTM-IU\_=20ms

- TLTM-RRC-processing =10 ms if UE does not support [*Early processing of an LTM candidate cell RRC configuration*], otherwise TLTM-RRC-processing =0ms

- TLTM-processing =10 ms if the UE supports [*faster LTM processing*] capability and UE reports 10 ms for FR1-to-FR1 cell switch in the capability

- TLTM-processing =15 ms if the UE supports [*faster LTM processing*] capability and UE reports 15 ms for FR1-to-FR1 cell switch in the capability

- TLTM-processing =20 ms if the UE does not support [*faster LTM processing*] capability.

#### A.6.3.x.2 RACH based Inter-frequency LTM PCell switch from FR1 to FR1

##### A.6.3.x.2.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR1-NR FR1 inter-frequency LTM RACH based cell switch delay requirements specified in clause 6.3.1 for both with and without early TCI state activation.

##### A.6.3.x.2.2 Test Parameters

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on a different frequency from the PCell. Test configurations are given in table A.6.3.x.2.2-1. Both cell switch delay and interruption length are tested by using the parameters in table A.6.3.x.2.2-2 and A.6.3.x.2.2-3.

The test consists of 4 tests, and UE is required to pass one among Test 1A, Test 1B, Test 2A and Test 2B.

- Test 1: for a UE supporting *ltm-MAC-CE-JointTCI-r18* and/o*r ltm-MAC-CE-SeparateTCI-r18*

- Test 1A: for a UE supporting *ltm-MAC-CE-JointTCI-r18*.

- Test 1B: for a UE supporting *ltm-MAC-CE-SeparateTCI-r18* and does not support *ltm-MAC-CE-JointTCI-r18*.

- Test 2: for a UE not supporting *ltm-MAC-CE-JointTCI-r18* and *ltm-MAC-CE-SeparateTCI-r18*

- Test 2A: for a UE supporting *ltm-BeamIndicationJointTCI-r18*.

- Test 2B: for a UE supporting *ltm-BeamIndicationSeparateTCI-r18* and does not support *ltm-BeamIndicationJointTCI-r18*.

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

During T1, for Test 1A, 1B,2A and 2B:

- A measurement object is configured for the frequency of the Cell 2, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

- T1 ends with UE reporting an L3 measurement result of Cell 2 to Cell 1.

During T2, for Test 1A, 1B, 2A and 2B:

- At the start of T2, UE is provided with *LTM-Candidate-r18* for Cell 2

- In Test 1A and Test 2A, joint TCI state configurations as defined in Table A.6.3.x.2.2-2 are provided.

- In Test 1B and Test 2B, separate TCI state configuration as defined in Table A.6.3.x.2.2-2 for are provided.

- UE is configured with SSB-based L1-RSRP measurements and periodic L1-RSRP measurement reports on candidate cell (Cell 2) in PUCCH format 2.

- T2 ends with UE reporting a valid L1-RSRP result of Cell 2.

During T3, for Test 1A and 1B:

- At the start of T3, UE receives candidate cell TCI state activation MAC CE for Cell 2.

- In Test 1A, *CandidateTCI-State#1* is activated.

- In Test 1B, *CandidateTCI-State#1* is activated.

- T3 ends 100 ms after the candidate cell TCI state activation MAC CE transmission.

- In Test 2A and 2B, T3 is skipped.

During T4, for Test 1A, 1B and 2A and 2B:

- The start of T4 is the instant when the last TTI containing LTM cell switch command MAC CE is sent by Cell 2 to the UE.

- In the cell switch command, Cell 2 is the target cell for PCell switch. Contention-Free Random-Access Resources are indicated and the field of Timing Advance Command is set to FFF.

- In test 1A, CandidateTCI-State#2 is indicated.

- In test 1B, CandidateTCI-State#2 is indicated.

- In test 2A, CandidateTCI-State#1 is indicated.

- In test 2B, CandidateTCI-State#1 is indicated.

- T4 ends upon the reception of PRACH at Cell 2.

Editors’ Note: FFS whether UL TCI State is configured in the FR1 test case.

Table A.6.3.x.2.2-1: Inter-frequency RACH based cell switch from FR1 to FR1 test configurations

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

Table A.6.3.x.2.2-2: General test parameters Inter-frequency RACH based cell switch from FR1 to FR1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | | | | Comment |
| Test 1A | Test 1B | Test 2A | Test 2B |
| Initial conditions | Active cell |  | Cell 1 | | | |  |
|  | Neighbouring cell |  | Cell 2 | | | | Cell 2 is the candidate cell |
| Final condition | Active cell |  | Cell 2 | | | |  |
| A3-Offset | | dB | -6 | | | |  |
| Hysteresis | | dB | 0 | | | |  |
| Time To Trigger | | s | 0 | | | |  |
| Filter coefficient | |  | 0 | | | | L3 filtering is not used |
| maxNrofRS-IndexesToReport | |  | 1 | | | |  |
| includeBeamMeasurements | |  | True | | | |  |
| DRX | |  | OFF | | | | DRX is not used |
| Measurement gap pattern ID | |  | gp0 | | | | As specified in Table 9.1.2-1 |
| Measurement gap offset | |  | 39 | | | |  |
| Access Barring Information | | - | Not Sent | | | | No additional delays in random access procedure. |
| Time offset between cells | |  | 2 μs | | | |  |
| LTM-CSI-ReportConfig | L1-RSRP reporting period | slot | 80 | | | | Periodic L1-RSRP reporting configured |
| nrOfReportedCells |  | n1 | | | | Report candidate cell’s (Cell 2) L1-RSRP measurement results. |
| nrOfReportedRS-PerCell |  | n1 | | | |
|  | spCellInclusion |  | N/A | | | |
| ltm-DL-OrJointTCI-StateToAddModList | CandidateTCI-State#1 |  | DLorJoint TCI.State.0 | DLorJoint TCI.State.2 | DLorJoint TCI.State.1 | DLorJoint TCI.State.3 | As specified in clause A.3.16B.  In test 1A and 1B, CandidateTCI-State#1 and CandidateTCI-UL-State#1 are configured for early TCI state activation.  CandidateTCI-State#2 and/or CandidateTCI-UL-State#1 are configured for TCI state indication in cell switch command.  In test 2A and 2B, CandidateTCI-State#1 and/or CandidateTCI-UL-State#1 are  configured for TCI state indication in cell switch command. |
| CandidateTCI-State#2 |  | DLorJoint TCI.State.1 | DLorJoint TCI.State.3 | N/A | N/A |
| [ltm-UL-TCI-StatesToAddModList] | CandidateTCI-UL-State#1 |  | N/A | UL TCI.State.0 | N/A | UL TCI.State.0 |
| ltm-ConfigComplete | |  | True | | | | Candidate cell’s configuration is complete configuration |
| T1 | | s | <3 | | | |  |
| T2 | | s | ≤0.2 | | | |  |
| T3 | | s | ≤0.2 | | | |  |
| T4 | | s | ≤0.1 | | | |  |

Table A.6.3.x.2.2-3: Cell specific test parameters for NR FR1-FR1 Inter frequency RACH-based cell switch test case

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Cell 1 | Cell 2 |
|  | | |  | T1-T4 | T1-T4 |
| 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 | |
| BWchannel | | Config 1 | MHz | 10: NRB,c = 52 | |
|  | | Config 2 |  | 10: NRB,c = 52 | |
|  | | Config 3 |  | 40: NRB,c = 106 | |
| BWP BW | | Config 1 | MHz | 10: NRB,c = 52 | |
|  | | Config 2 |  | 10: NRB,c = 52 | |
|  | | Config 3 |  | 40: NRB,c = 106 | |
| DRx Cycle | | | ms | Not Applicable | |
| PDSCH Reference | | Config 1 |  | SR.1.1 FDD | |
| measurement channel | | 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 for serving cell | | 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 | |
|  | | 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) | | |
| Note2 | | | dBm/15kHz | -98 | |
| Note2 | Config 1,2 | | dBm/SCS | -98 | |
|  | Config 3 | |  | -95 | |
|  | | | dB | 8 | 8 |
|  | | | dB | 8 | 8 |
| SSB\_RP | Config 1,2 | | dBm/SCS | -90 | -90 |
|  | Config 3 | | dBm/SCS | -87 | -87 |
| IoNote3 | Config 1,2 | | dBm/  9.36MHz | -61.41 | -61.41 |
|  | Config 3 | | dBm/  38.16MHz | -55.31 | -55.31 |
| 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  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | |

##### A.6.3.x.2.3 Test Requirements

The UE shall start to transmit PRACH to Cell 2 in no later than DLTM from the beginning of time period T4.

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

NOTE: The cell switch delay can be expressed as DLTM (= Tcmd + TLTM-interrupt), where:

Tcmd = THARQ + 3ms and is specified in clause 6.3.1.2, TLTM-interrupt is defined in clause 6.3.1.3 as TLTM-RRC-processing + TLTM-processing + Tfirst-RS + TRS-proc + TLTM-IU,

- Tfirst-RS + TRS-proc= 0 ms for Test 1A and 1B, Tfirst-RS + TRS-proc= 22 ms for Test 2A and 2B,

- TLTM-IU\_= 20 ms.

- TLTM-RRC-processing =10ms if UE does not support [*Early processing of an LTM candidate cell RRC configuration*], otherwise TLTM-RRC-processing = 0 ms

- TLTM-processing = 10 ms if the UE supports [*faster LTM processing*] capability and UE reports 10 ms for FR1-to-FR1 cell switch in the capability

- TLTM-processing = 15 ms if the UE supports [*faster LTM processing*] capability and UE reports 15 ms for FR1-to-FR1 cell switch in the capability

- TLTM-processing = 20 ms if the UE does not support [*faster LTM processing*] capability.

#### A.6.3.X.3 RACH-less Intra-frequency PCell switch from FR1 to FR1

##### A.6.3.X.3.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR1-NR FR1 RACH-less intra frequency PCell switch specified in clause 6.3.1 for both with and without early TCI state activation.

##### A.6.3.X.3.2 Test Parameters

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. Supported test configurations are shown in table A.6.3.X.3.2-1. Both cell switch delay and interruption length are tested by using the parameters in table A.6.3.X.3.2-2, and A.6.3.X.3.2-3.

The test consists of 4 tests, and UE is required to pass one among Test 1A, Test 1B, Test 2A and Test 2B.

- Test 1: for a UE supporting *ltm-MAC-CE-JointTCI-r18* and/or *ltm-MAC-CE-SeparateTCI-r18*

- Test 1A: for a UE supporting *ltm-MAC-CE-JointTCI-r18*.

- Test 1B: for a UE supporting *ltm-MAC-CE-SeparateTCI-r18* and does not support *ltm-MAC-CE-JointTCI-r18*.

- Test 2: for a UE not supporting *ltm-MAC-CE-JointTCI-r18* and *ltm-MAC-CE-SeparateTCI-r18*

- Test 2A: for a UE supporting *ltm-BeamIndicationJointTCI-r18*.

- Test 2B: for a UE supporting *ltm-BeamIndicationSeparateTCI-r18* and does not support *ltm-BeamIndicationJointTCI-r18*

The test consists of five successive time periods, with time durations of T1, T2, T3, T4 and T5, respectively. No gap patterns are configured in the test case.

During T1, for Test 1A, 1B, 2A and 2B:

- A measurement object is configured for the frequency of the Cell 2, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

- T1 ends with UE reporting an L3 measurement result of Cell 2 to Cell 1.

During T2, for Test 1A, 1B, 2A and 2B:

- At the start of T2, UE is provided with *LTM-Candidate-r18* for Cell 2

- Joint TCI state configuration as defined in Table A.6.3.x.3.2-2 for Test 1A and Test 2A are provided.

- Separate TCI state configuration as defined in Table A.6.3.x.3.2-2 for Test 1B and Test 2B are provided.

- UE is configured with SSB-based L1-RSRP measurements and periodic L1-RSRP measurement reports on candidate cell (Cell 2) in PUCCH format 2.

- T2 ends with UE reporting a valid L1-RSRP result of Cell 2.

During T3, for Test 1A and 1B:

- At the start of T3, UE receives candidate cell TCI state activation MAC CE for Cell 2.

- In Test 1A, *CandidateTCI-State#1* is activated.

- In Test 1B, *CandidateTCI-State#1* and *CandidateTCI-UL-State#1* is activated.

- T3 ends 50ms after the candidate cell TCI state activation MAC CE transmission.

- In Test 2A and 2B, T3 is skipped.

During T4, for Test 1A, 1B, 2A and 2B:

- At the start of T4, UE receives PDCCH order to trigger PRACH transmission on Cell 2.

- T4 ends 5ms after the UE transmits the PRACH to Cell 2.

- For UE incapable of *rach-EarlyTA-Measurement-r18*, T4 is skipped.

During T5, for Test 1A, 1B, 2A and 2B:

- The start of T5 is the last TTI containing LTM cell switch command MAC CE is sent by Cell 1 to the UE.

- In the cell switch command, Cell 2 is the target cell and the field of Timing Advance Command is set to 0.

- In test 1A, CandidateTCI-State#2 is indicated.

- In test 1B, CandidateTCI-State#2 and CandidateTCI-UL-State#1 are indicated.

- In test 2A, CandidateTCI-State#1 is indicated.

- In test 2B, CandidateTCI-State#1 and CandidateTCI-UL-State#1 are indicated.

- Cell 2 continuously schedules PUSCH for the UE.

- T5 ends either at the UL slot of PUSCH scheduled by Cell 2 at the first DL slot not earlier than (Tcmd + TLTM-RRC-processing + TLTM-processing + Tfirst-RS + TRS-proc) after the beginning of T5 or upon the reception of PUSCH at Cell 2, whichever is earlier.

- The values of Tcmd, TLTM-RRC-processing TLTM-processing,Tfirst-RS and TRS-proc are specified in A.6.3.x.3.3.

Table A.6.3.X.3.2-1: Intra-frequency cell switch from FR1 to FR1 test configurations

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

Table A.6.3.X.3.2-2: General test parameters Intra-frequency cell switch from FR1 to FR1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | | | | Comment |
| Test 1A | Test 1B | Test 2A | Test 2B |
| Initial conditions | Active cell |  | Cell 1 | | | |  |
|  | Neighbouring cell |  | Cell 2 | | | | Cell 2 is the candidate cell |
| Final condition | Active cell |  | Cell 2 | | | |  |
| A3-Offset | | dB | -6 | | | |  |
| Hysteresis | | dB | 0 | | | |  |
| Time To Trigger | | s | 0 | | | |  |
| Filter coefficient | |  | 0 | | | | L3 filtering is not used |
| DRX | |  | OFF | | | | DRX is not used |
| Access Barring Information | | - | Not Sent | | | | No additional delays in random access procedure. |
| Time offset between cells | |  | 2 μs | | | | RTD between cells is less than CP |
| deriveSSB-IndexFromCell | |  | Enabled | | | |  |
| EarlyUL-SyncConfig | frequencyInfoUL |  | NR RF Channel Number 1 | | | | Same as Cell 1 |
| PRACH configuration |  | FR1 PRACH configuration 5 | | | | RACH bandwidth is within active UL BWP of Cell 1 |
| bwp-GenericParameters |  | ULBWP.0.1 | | | |  |
| n-TimingAdvanceOffset | Tc | 25600 | | | |  |
| ltm-CSI-SSB-ResourceList | |  | SSB 0 of Cell 2 | | | |  |
| LTM-CSI-ReportConfig | L1-RSRP reporting period | slot | 80 | | | | Periodic L1-RSRP reporting configured |
| nrOfReportedCells |  | n1 | | | | Report candidate cell’s (Cell 2) L1-RSRP measurement results. |
| nrOfReportedRS-PerCell |  | n1 | | | |
|  | spCellInclusion |  | N/A | | | |
| ltm-DL-OrJointTCI-StateToAddModList | CandidateTCI-State#1 |  | DLorJoint TCI.State.0 | DLorJoint TCI.State.2 | DLorJoint TCI.State.1 | DLorJoint TCI.State.3 | As specified in clause A.3.16B.  In test 1A and 1B, CandidateTCI-State#1 and/or CandidateTCI-UL-State#1 are configured for early TCI state activation. CandidateTCI-State#2 and/or CandidateTCI-UL-State#1 are configured for TCI state indication in cell switch command.  In test 2A and 2B, CandidateTCI-State#1 and/or CandidateTCI-UL-State#1 are configured for TCI state indication in cell switch command. |
| CandidateTCI-State#2 |  | DLorJoint TCI.State.1 | DLorJoint TCI.State.3 | N/A | N/A |
| ltm-UL-TCI-StatesToAddModList | CandidateTCI-UL-State#1 |  | N/A | UL TCI.State.0 | N/A | UL TCI.State.0 |
|  |  |  |  |  |  |
| ltm-ConfigComplete | |  | True | | | | Candidate cell’s configuration is complete configuration |
| T1 | | s | <3 | | | |  |
| T2 | | s | ≤0.2 | | | |  |
| T3 | | s | ≤0.1 | | | |  |
| T4 | | s | ≤0.2 | | | |  |
| T5 | | s | ≤0.1 | | | |  |

Table A.6.3.X.3.2-3: Cell specific test parameters for NR FR1-FR1 Intra frequency cell switch test case

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Cell 1 | Cell 2 |
|  | | |  | T1~T5 | T1~T5 |
| 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 | |
| BWchannel | | Config 1 | MHz | 10: NRB,c = 52 | |
|  | | Config 2 |  | 10: NRB,c = 52 | |
|  | | Config 3 |  | 40: NRB,c = 106 | |
| BWP BW | | Config 1 | MHz | 10: NRB,c = 52 | |
|  | | Config 2 |  | 10: NRB,c = 52 | |
|  | | Config 3 |  | 40: NRB,c = 106 | |
| DRx Cycle | | | ms | Not Applicable | |
| PDSCH Reference | | Config 1 |  | SR.1.1 FDD | |
| measurement channel | | 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 | 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 | |
|  | | 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) | | |
| Note2 | | | dBm/15kHz | -98 | |
| Note2 | Config 1,2 | | dBm/SCS | -98 | |
|  | Config 3 | |  | -95 | |
|  | | | dB | [-0.64] | [-0.64] |
|  | | | dB | [8] | [8] |
| SSB\_RP | Config 1,2 | | dBm/SCS | [-90] | [-90] |
|  | Config 3 | | dBm/SCS | [-87] | [-87] |
| IoNote3 | Config 1,2 | | dBm/  9.36MHz | [-58.7] | [-58.7] |
|  | Config 3 | | dBm/  38.16MHz | [-52.6] | [-52.6] |
| 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  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | |

##### A.6.3.X.3.3 Test Requirements

The UE shall start to transmit PUSCH to Cell 2 in no later than DLTM from the beginning of time period T5.

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

NOTE: The cell switch delay can be expressed as DLTM (= Tcmd + TLTM-interrupt), where:

Tcmd = THARQ + 3ms and is specified in clause 6.3.1.2.

TLTM-interrupt is defined in clause 6.3.1.3 as TLTM-RRC-processing + TLTM-processing + Tfirst-RS + TRS-proc + TLTM-IU. Tfirst-RS + TRS-proc=0 for Test 1A and 1B, Tfirst-RS + TRS-proc=22ms for Test 2A and 2B, and TLTM-IU\_is the uncertainty on transmitting the first uplink transmission on Cell 2.

- TLTM-RRC-processing = 10 ms if UE does not support [*Early processing of an LTM candidate cell RRC configuration*], otherwise TLTM-RRC-processing =0ms

- TLTM-processing = 10 ms if the UE supports [*faster LTM processing*] capability and UE reports 10 ms for FR1-to-FR1 cell switch in the capability

- TLTM-processing = 15 ms if the UE supports [*faster LTM processing*] capability and UE reports 15 ms for FR1-to-FR1 cell switch in the capability

- TLTM-processing = 20 ms if the UE does not support [*faster LTM processing*] capability.

End of Change 9

Start of Change 10

### A.6.3.y LTM PSCell Switch

#### A.6.3.y.1 RACH-based intra-frequency LTM PSCell switch from FR1 to FR1

##### A.6.3.y.1.1 Test Purpose and Environment

This test is to verify the intra-frequency RACH based LTM PSCell switch requirements from NR FR1 to NR FR1 specified in clause 8.20 for both with and without early TCI state activation.

##### A.6.3.y.1.2 Test Parameters

Three cells are deployed in the test, which are FR1 PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell. The test configurations of PCell and PSCell are given in Table A.6.3.y.1.2-1 and Table A.6.3.y.1.2-1A. Both cell switch delay and interruption length are tested by using the parameters in Table A.6.3.y.1.2-2 and Table A.6.3.y.1.2-3.

The test consists of 4 tests, and UE is required to pass one among Test 1A, Test 1B, Test 2A and Test 2B.

- Test 1: for a UE supporting *ltm-MAC-CE-JointTCI-r18 and/or ltm-MAC-CE-SeparateTCI-r18*

- Test 1A: for a UE supporting *ltm-MAC-CE-JointTCI-r18*.

- Test 1B: for a UE supporting *ltm-MAC-CE-SeparateTCI-r18* and does not support *ltm-MAC-CE-JointTCI-r18*.

- Test 2: for a UE not supporting *ltm-MAC-CE-JointTCI-r18 and ltm-MAC-CE-SeparateTCI-r18*

- Test 2A: for a UE supporting *ltm-BeamIndicationJointTCI-r18*.

- Test 2B: for a UE supporting *ltm-BeamIndicationSeparateTCI-r18* and does not support *ltm-BeamIndicationJointTCI-r18*.

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

During T1, for Test 1A, 1B, 2A and 2B:

- A measurement object is configured for the frequency of the Cell 3, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

- T1 ends with UE reporting an L3 measurement result of Cell 3 to Cell 2.

During T2, for Test 1A, 1B, 2A and 2B:

- At the start of T2, UE is provided with *LTM-Candidate-r18* for Cell 3

- Joint TCI state configuration as defined in Table A.6.3.y.1.2-2 for Test 1A and Test 2A are provided.

- Separate TCI state configuration as defined in Table A.6.3.y.1.2-2 for Test 1B and Test 2B are provided.

- UE is configured with SSB-based L1-RSRP measurements and periodic L1-RSRP measurement reports for candidate cell (Cell 3) in PUCCH format 2.

- T2 ends with UE reporting a valid L1-RSRP result of Cell 3.

During T3, for Test 1A and 1B:

- At the start of T3, UE receives candidate cell TCI state activation MAC CE for Cell 3.

- In Test 1A, *CandidateTCI-State#1* is activated.

- In Test 1B, *CandidateTCI-State#1* and *CandidateTCI-UL-State#1* is activated.

- T3 ends 50 ms after the candidate cell TCI state activation MAC CE transmission.

- In Test 2A and 2B, T3 is skipped.

During T4, for Test 1A, 1B, 2A and 2B:

- The start of T4 is the instant when the last TTI containing LTM cell switch command MAC CE is sent by Cell 2 to the UE.

- In the cell switch command, Cell 3 is the target cell for PSCell switch. Contention-Free Random-Access Resources are indicated and the field of Timing Advance Command is set to FFF.

- In test 1A, CandidateTCI-State#2 is indicated.

- In test 1B, CandidateTCI-State#2 and CandidateTCI-UL-State#1 are indicated.

- In test 2A, CandidateTCI-State#1 is indicated.

- In test 2B, CandidateTCI-State#1 and CandidateTCI-UL-State#1 are indicated.- T4 ends upon the reception of PRACH at Cell 3.

Table A.6.3.y.1.2-1: Supported PCell test configurations for intra-frequency PSCell cell switch from FR1 to FR1

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

Table A.6.3.y.1.2-1A: Supported PSCell test configurations for intra-frequency PSCell cell switch from FR1 to FR1

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

Table A.6.3.y.1.2-2: General test parameters for Intra-frequency cell switch from FR1 to FR1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | | | | Comment |
| Test 1A | Test 1B | Test 2A | Test 2B |
| Initial conditions | Active cells |  | Cell 1 (PCell), Cell 2 (PSCell) | | | |  |
|  | Neighbouring cell |  | Cell 3 | | | | Cell 3 is the candidate cell |
| Final condition | Active cells |  | Cell 1 (PCell), Cell 3 (PSCell) | | | |  |
| A3-Offset | | dB | -6 | | | |  |
| Hysteresis | | dB | 0 | | | |  |
| Time To Trigger | | s | 0 | | | |  |
| Filter coefficient | |  | 0 | | | | L3 filtering is not used |
| DRX | |  | OFF | | | | DRX is not used |
| Access Barring Information | | - | Not Sent | | | | No additional delays in random access procedure. |
| Time offset between Cell 2 and Cell 3 | |  | 2 μs | | | | RTD between Cell 2 and Cell 3 is less than CP |
| deriveSSB-IndexFromCell | |  | Enabled | | | |  |
| LTM-CSI-ReportConfig | L1-RSRP reporting period | slot | 80 | | | | Periodic L1-RSRP reporting configured |
| nrOfReportedCells |  | n1 | | | | Report candidate cell’s (Cell 3) L1-RSRP measurement results. |
| nrOfReportedRS-PerCell |  | n1 | | | |
|  | spCellInclusion |  | N/A | | | |
| ltm-DL-OrJointTCI-StateToAddModList | CandidateTCI-State#1 |  | DLorJoint TCI.State.0 | DLorJoint TCI.State.2 | DLorJoint TCI.State.1 | DLorJoint TCI.State.3 | As specified in clause A.3.16B.  In test 1A and 1B, CandidateTCI-State#1 and/or CandidateTCI-UL-State#1 are configured for early TCI state activation.  CandidateTCI-State#2 and/or CandidateTCI-UL-State#1 are configured for TCI state indication in cell switch command.  In test 2A and 2B, CandidateTCI-State#1 and/or CandidateTCI-UL-State#1 are  configured for TCI state indication in cell switch command. |
| CandidateTCI-State#2 |  | DLorJoint TCI.State.1 | DLorJoint TCI.State.3 | N/A | N/A |
| ltm-UL-TCI-StatesToAddModList | CandidateTCI-UL-State#1 |  | N/A | UL TCI.State.0 | N/A | UL TCI.State.0 |
|  |  |  |  |  |  |
| ltm-ConfigComplete | |  | True | | | | Candidate cell’s configuration is complete configuration |
| T1 | | s | <3 | | | |  |
| T2 | | s | ≤0.2 | | | |  |
| T3 | | s | ≤0.1 | | | |  |
| T4 | | s | ≤0.1 | | | |  |

Table A.6.3.y.1.2-3: Cell specific test parameters for NR FR1-FR1 Intra-frequency cell switch test case

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Cell 1 | Cell 2 | Cell 3 |
|  | | |  | T1 ~ T4 | T1 ~ T4 | T1 ~ T4 |
| NR RF Channel Number | |  |  | 1 | 2 | 2 |
| Duplex mode | | Config 1, 1A |  | FDD | | |
| Config 2, 3, 2A, 3A |  | TDD | | |
| TDD configuration | | Config 1, 1A |  | Not Applicable | | |
| Config 2, 2A |  | TDDConf.1.1 | | |
| Config 3, 3A |  | TDDConf.2.1 | | |
| BWchannel | | Config 1, 1A | MHz | 10: NRB,c = 52 | | |
| Config 2, 2A | MHz | 10: NRB,c = 52 | | |
| Config 3, 3A | MHz | 40: NRB,c = 106 | | |
| BWP BW | | Config 1, 1A | MHz | 10: NRB,c = 52 | | |
| Config 2, 2A | MHz | 10: NRB,c = 52 | | |
| Config 3, 3A | MHz | 40: NRB,c = 106 | | |
| PDSCH Reference | | Config 1, 1A |  | SR.1.1 FDD | | |
| Config 2, 2A |  | SR.1.1 TDD | | |
| Config 3, 3A |  | SR.2.1 TDD | | |
| CORESET Reference Channel | | Config 1, 1A |  | CR.1.1 FDD | | |
| Config 2, 2A |  | CR.1.1 TDD | | |
| Config 3, 3A |  | CR.2.1 TDD | | |
| CP length | | Config 1, 2, 3, 1A, 2A, 3A |  | Normal | | |
| TRS configuration | | Config 1, 1A |  | TRS.1.1 FDD | | |
| Config 2, 2A |  | TRS.1.1 TDD | | |
| Config 3, 3A |  | TRS.1.2 TDD | | |
| OCNG Patterns | | Config 1, 2, 3, 1A, 2A, 3A |  | OP.1 | | |
| SMTC Configuration | | Config 1, 2, 3, 1A, 2A, 3A |  | SMTC.1 | | |
| SSB Configuration | | Config 1,2, 1A, 2A |  | SSB.1 FR1 | | |
| Config 3, 3A |  | SSB.2 FR1 | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2, 1A, 2A | kHz | 15 | | |
| Config 3, 3A | kHz | 30 | | |
| PUCCH/PUSCH subcarrier spacing | | Config 1,2, 1A, 2A | kHz | 15 | | |
| Config 3, 3A | kHz | 30 | | |
| PRACH configuration | | Config 1, 2, 3, 1A, 2A, 3A |  | FR1 PRACH configuration 1 | | |
| BWP configuration | Initial DL BWP | Config 1, 2, 3, 1A, 2A, 3A |  | DLBWP.0.1 | | |
|  | Dedicated DL BWP | Config 1, 2, 3, 1A, 2A, 3A |  | DLBWP.1.1 | | |
|  | Initial UL BWP | Config 1, 2, 3, 1A, 2A, 3A |  | ULBWP.0.1 | | |
|  | Dedicated UL BWP | Config 1, 2, 3, 1A, 2A, 3A |  | ULBWP.1.1 | | |
| EPRE ratio of PSS to SSS | | Config 1, 2, 3, 1A, 2A, 3A | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | Config 1, 2, 3, 1A, 2A, 3A |
| EPRE ratio of PBCH to PBCH DMRS | | Config 1, 2, 3, 1A, 2A, 3A |
| EPRE ratio of PDCCH DMRS to SSS | | Config 1, 2, 3, 1A, 2A, 3A |
| EPRE ratio of PDCCH to PDCCH DMRS | | Config 1, 2, 3, 1A, 2A, 3A |
| EPRE ratio of PDSCH DMRS to SSS | | Config 1, 2, 3, 1A, 2A, 3A |
| EPRE ratio of PDSCH to PDSCH | | Config 1, 2, 3, 1A, 2A, 3A |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | Config 1, 2, 3, 1A, 2A, 3A |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | Config 1, 2, 3, 1A, 2A, 3A |
| Note2 | | Config 1, 2, 3, 1A, 2A, 3A | dBm/15kHz | -98 | | |
| Note2 | | Config 1,2, 1A, 2A | dBm/SCS | -98 | | |
| Config 3, 3A | -95 | | |
|  | | Config 1, 2, 3, 1A, 2A, 3A | dB | 11 | -0.64 | -0.64 |
|  | | Config 1, 2, 3, 1A, 2A, 3A | dB | 11 | 8 | 8 |
| SSB\_RP | | Config 1,2, 1A, 2A | dBm/SCS | -87 | -90 | -90 |
| Config 3, 3A | dBm/SCS | -84 | -87 | -87 |
| IoNote3 | | Config 1,2, 1A, 2A | dBm/  9.36MHz | -58.7 | -58.7 | -58.7 |
| Config 3, 3A | dBm/  38.16MHz | -52.62 | -52.6 | -52.6 |
| Propagation condition | | Config 1, 2, 3, 1A, 2A, 3A | - | AWGN | 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  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

##### A.6.3.y.1.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 3 in no later than DLTM from the beginning of time period T4.

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

NOTE: The cell switch delay can be expressed as DLTM (= Tcmd + TLTM-RRC-processing + TLTM-processing + Tfirst-RS + TRS-proc + TLTM-IU), where:

Tcmd = THARQ + 3ms and is specified in clause 6.3.1.2

- Tfirst-RS + TRS-proc= 0 ms for Test 1A and 1B, Tfirst-RS + TRS-proc= 22 ms for Test 2A and 2B

- TLTM-IU = 20 ms

- TLTM-RRC-processing = 10 ms if UE does not support [Early processing of an LTM candidate cell RRC configuration], otherwise TLTM-RRC-processing =0ms

- TLTM-processing = 10 ms if the UE supports [*faster LTM processing*] capability and UE reports 10 ms for FR1-to-FR1 cell switch in the capability

- TLTM-processing = 15 ms if the UE supports [*faster LTM processing*] capability and UE reports 15 ms for FR1-to-FR1 cell switch in the capability

- TLTM-processing = 20 ms if the UE does not support [*faster LTM processing*] capability.

End of Change 10

Start of Change 11

### A.6.6.x LTM Intra-frequency L1-RSRP measurement

#### A.6.6.x.1 Intra-frequency SSB based L1-RSRP measurement in FR1

##### A.6.6.x.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of SSB based intra-frequency L1-RSRP measurement on neighbor cell in FR1. This test will partly verify the requirements for SSB based intra-frequency L1-RSRP measurement on neighbor cell specified in clause 9.14, with the testing configurations for NR cells in Table A.6.6.x.1.1-1.

Table A.6.6.x.1.1-1: Applicable NR configurations for SSB based intra-frequency L1-RSRP LTM measurement test in FR1

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

##### A.6.6.x.1.2 Test Parameters

Two cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. Measurement period [and measurement accuracy] is tested by using the parameters in table A.6.6.x.1.2-1, and A.6.6.x.1.2-2.

There are two tests in the test case, test 1 and test 2:

* In test 1, time offset between cells is within CP length.
* In test 2, time offset between cells is larger than CP length.

If a UE does not support *[RTD>CP]*, it is only required to pass test 1. Otherwise, it is only required to pass test 2.

The test consists of two successive time periods, with time durations of T1 and T2 respectively. SSB\_RP of Cell 2 in T1 and T2 are different. No gap patterns are configured in the test case.

Prior to the start of the time duration T1,

- UE is connected to Cell 1 (PCell) on RF channel 1 (PCC).

- A measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. Before the start of the T1, event is triggered, and UE has sent a measurement report for the Cell 2 with SSB Index.

- UE is provided with *LTM-Candidate-r18* for Cell 2*.*

- UE is configured with SSB-based L1-RSRP measurements and periodic L1-RSRP measurement reports on candidate cell (Cell 2) in PUCCH format 2.

At the beginning of T2, SSB\_RP of Cell 2 changes to a different value from T1. T2 starts at the beginning of a frame with an odd SFN.

Table A.6.6.x.1.2-1: General test parameters for SSB based intra-frequency L1-RSRP LTM measurement test in FR1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | | Comment |
| Test 1 | Test 2 |
| Active cell | |  | Cell 1 | |  |
| Neighbouring cell | |  | Cell 2 | | Cell 2 is the candidate cell |
| A3-Offset | | dB | -6 | |  |
| Hysteresis | | dB | 0 | |  |
| Time To Trigger | | ms | 0 | |  |
| Filter coefficient | |  | 0 | | L3 filtering is not used |
| DRX | |  | OFF | | DRX is not used |
| Time offset between cells | |  | 2 μs | 20μs | The timing of Cell 2 is later than the timing of Cell 1 |
| deriveSSB-IndexFromCell | |  | Enabled | |  |
| LTM-CSI-ReportConfig | L1-RSRP reporting period | slot | 80 | | Periodic L1-RSRP reporting configured |
| nrOfReportedCells |  | n1 | | Report candidate cell’s (Cell 2) L1-RSRP measurement results. |
| nrOfReportedRS-PerCell |  | n1 | |
|  | spCellInclusion |  | N/A | |
| ltm-ConfigComplete | |  | True | | Candidate cell’s configuration is complete configuration |
| T1 | | s | 0.3 | |  |
| T2 | | s | ≤ 0.5 | |  |

Table A.6.6.x.1.2-2: Cell specific test parameters for SSB based intra-frequency L1-RSRP LTM measurement test in FR1

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Cell 1 | | | Cell 2 | |
|  | | |  | T1 | T2 | | T1 | T2 |
| NR RF Channel Number | | |  | 1 | | | | |
| SSB GSCN | | |  | freq1 | | | | |
| Duplex mode | | Config 1 |  | FDD | | | | |
|  | | Config 2,3 |  | TDD | | | | |
| TDD configuration | | Config 1 |  | Not Applicable | | | | |
|  | | Config 2 |  | TDDConf.1.1 | | | | |
|  | | Config 3 |  | TDDConf.2.1 | | | | |
| BWchannel | | Config 1 | MHz | 10: NRB,c = 52 | | | | |
|  | | Config 2 |  | 10: NRB,c = 52 | | | | |
|  | | Config 3 |  | 40: NRB,c = 106 | | | | |
| BWP BW | | Config 1 | MHz | 10: NRB,c = 52 | | | | |
|  | | Config 2 |  | 10: NRB,c = 52 | | | | |
|  | | Config 3 |  | 40: NRB,c = 106 | | | | |
| PDSCH Reference | | Config 1 |  | SR.1.1 FDD | | N/A | | |
| measurement channel | | Config 2 |  | SR.1.1 TDD | | N/A | | |
|  | | Config 3 |  | SR.2.1 TDD | | N/A | | |
| CORESET Reference Channel | | Config 1 |  | CR.1.1 FDD | | N/A | | |
|  | | Config 2 |  | CR.1.1 TDD | | N/A | | |
|  | | Config 3 |  | CR.2.1 TDD | | N/A | | |
| CP length | |  |  | Normal | | | | |
| 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 | | | | |
|  | | Config 3 |  | 30 | | | | |
| PUCCH/PUSCH subcarrier spacing | | Config 1,2 | KHz | 15 | | | | |
|  | | Config 3 |  | 30 | | | | |
| 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) | | |  |  | | | | |
| Note2 | | | dBm/15kHz | -101 | | | | |
| Note2 | Config 1,2 | | dBm/SCS | -101 | | | | |
|  | Config 3 | |  | -98 | | | | |
|  | | | dB | -1.76 | -0.19 | | -1.76 | -0.19 |
|  | | | dB | 3 | 14.5 | | 3 | 14.5 |
| SSB\_RP | Config 1,2 | | dBm/SCS | -98 | -87.5 | | -98 | -87.5 |
|  | Config 3 | | dBm/SCS | -95 | -84.5 | | -95 | -84.5 |
| IoNote3 | Config 1,2 | | dBm/  9.36MHz | -66.07 | -56.44 | | -66.07 | -56.44 |
|  | Config 3 | | dBm/  38.16MHz | -59.96 | -50.34 | | -59.96 | -50.34 |
| 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  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | |

##### A.6.6.x.1.3 Test Requirements

The UE shall send L1-RSRP report every 80 slots. The UE shall start to report a larger L1-RSRP value of Cell 2 in no later than 20 ms plus 80 slots from the beginning of time period T2. UE shall send L1-RSRP report including results of Cell 2 while meeting the L1-RSRP absolute accuracy requirement in clause 10.1.19X.

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

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

End of Change 11

Start of Change 12

### A.6.6.y LTM Inter-frequency L1-RSRP measurement with measurement gap

#### A.6.6.y.1 Inter-frequency SSB based L1-RSRP measurement with measurement gap

##### A.6.6.y.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of inter-frequency L1-RSRP measurement with measurement gap on candidate neighbour cell. This test will partly verify the L1-RSRP measurement requirements in clause 9.15.5, with the testing configurations for NR cells in Table A.6.6.y.1.1-1.

Table A.6.6.y.1.1-1: Applicable NR configurations for SSB based inter-frequency L1-RSRP LTM measurement with MG test in FR1

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

##### A.6.6.y.1.2 Test parameters

There are two carriers and one cell on each carrier in the test, NR Cell 1 as PCell in FR1 on NR RF channel 1 and NR Cell 2 as neighbour cell in FR1 on NR RF channel 2. The test parameters for the Cell 1 and Cell 2 are given in Table A.6.6.y.1.2-1 and Table A.6.6.y.1.2-2 below.

In CSI measurement configuration, UE is indicated to perform inter-frequency L1-RSRP measurement on the SSBs and report periodically. The test consists of two successive time periods, with time duration of T1 and T2 respectively.

Measurement gap pattern configuration defined in Table A.6.6.y.1.2-1 is provided.

Prior to the start of the time duration T1,

- UE is connected to Cell 1 (PCell) on RF channel 1 (PCC).

- A measurement object is configured for the RF channel 2, and it is indicated to the UE that event-triggered reporting with Event A3 is used. Before the start of the T1, event is triggered, and UE has sent a measurement report for the Cell 2 with SSB Index.

- UE is provided with *LTM-Candidate-r18* for Cell 2*.*

- UE is configured with SSB-based L1-RSRP measurements and periodic L1-RSRP measurement reports on candidate cell (Cell 2) in PUCCH format 2.

At the beginning of T2, SSB\_RP of Cell 2 changes to a different value from T1.

Table A.6.6.y.1.2-1: General test parameters for SSB based inter-frequency L1-RSRP LTM measurement with MG test in FR1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Active cell | |  | Cell 1 |  |
| Neighbouring cell | |  | Cell 2 | Cell 2 is the candidate cell |
| A3-Offset | | dB | -6 |  |
| Hysteresis | | dB | 0 |  |
| Time To Trigger | | ms | 160 |  |
| Filter coefficient | |  | 0 | L3 filtering is not used |
| maxNrofRS-IndexesToReport | |  | 1 |  |
| includeBeamMeasurements | |  | True |  |
| DRX | |  | OFF | DRX is not used |
| Time offset between cells | |  | 3 μs | The timing of Cell 2 is later than the timing of Cell 1 |
| deriveSSB-IndexFromCell | |  | Enabled | Not relevant to this test case |
| Gap Pattern Id | |  | 0 |  |
| Measurement gap offset | | ms | 39 |  |
| LTM-CSI-ReportConfig | L1-RSRP reporting period | slot | 80 | Periodic L1-RSRP reporting configured |
| nrOfReportedCells |  | n1 | Report candidate cell’s (Cell 2) L1-RSRP measurement results. |
| nrOfReportedRS-PerCell |  | n1 |
|  | spCellInclusion |  | N/A |
| ltm-ConfigComplete | |  | True | Candidate cell’s configuration is complete configuration |
| T1 | | s | 0.3 |  |
| T2 | | s | ≤ 0.5 |  |

Table A.6.6.y.1.2-2: Cell specific test parameters for SSB based inter-frequency L1-RSRP LTM measurement with MG test in FR1

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | Cell 1 | | Cell 2 | |
| T1 | T2 | T1 | T2 |
| SSB GSCN | 1~3 |  | freq1 | | freq2 | |
| Duplex mode | 1 |  | FDD | | | |
|  | 2 |  | TDD | | | |
|  | 3 |  | TDD | | | |
| TDD Configuration | 1 |  | N/A | | | |
|  | 2 |  | TDDConf.1.1 | | | |
|  | 3 |  | TDDConf.2.1 | | | |
| BWchannel | 1 | MHz | 10: NRB,c = 52 | | | |
|  | 2 |  | 10: NRB,c = 52 | | | |
|  | 3 |  | 40: NRB,c = 106 | | | |
| PDSCH Reference measurement channel | 1 |  | SR.1.1 FDD | | N/A | |
|  | 2 |  | SR.1.1 TDD | | N/A | |
|  | 3 |  | SR.2.1 TDD | | N/A | |
| RMSI CORESET Reference Channel | 1 |  | CR.1.1 FDD | | N/A | |
|  | 2 |  | CR.1.1 TDD | | N/A | |
|  | 3 |  | CR.2.1 TDD | | N/A | |
| Dedicated CORESET Reference Channel | 1 |  | CCR.1.1 FDD | | N/A | |
|  | 2 |  | CCR.1.1 TDD | | N/A | |
|  | 3 |  | CCR.2.1 TDD | | N/A | |
| SSB configuration | 1 |  | SSB.1 FR1 | | | |
|  | 2 |  | SSB.1 FR1 | | | |
|  | 3 |  | SSB.2 FR1 | | | |
| OCNG Patterns | 1~3 |  | OP.1 | | OP.1 | |
| Initial BWP Configuration | 1~3 |  | DLBWP.0.1  ULBWP.0.1 | | | |
| Dedicated BWP configuration | 1~3 |  | DLBWP.1.1  ULBWP.1.1 | | | |
| SMTC configuration | 1~3 |  | SMTC.1 | | | |
| TRS Configuration | 1 |  | TRS.1.1 FDD | | N/A | |
|  | 2 |  | TRS.1.1 TDD | | N/A | |
|  | 3 |  | TRS.1.2 TDD | | N/A | |
| EPRE ratio of PSS to SSS | 1~3 | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS |  |  |
| EPRE ratio of PBCH to PBCH DMRS |  |  |
| EPRE ratio of PDCCH DMRS to SSS |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS |  |  |
| EPRE ratio of PDSCH DMRS to SSS |  |  |
| EPRE ratio of PDSCH to PDSCH DMRS |  |  |
| EPRE ratio of OCNG DMRS to SSSNote 1 |  |  |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |  |  |
| Note2 | 1~3 | dBm/15kHz | -94.65 | | | |
| Note2 | 1,2 | dBm/SCS | -94.65 | | | |
|  | 3 |  | -91.65 | | | |
|  | 1~3 | dB | 0 | 0 | 0 | 10 |
|  | 1~3 | dB | 0 | 0 | 0 | 10 |
| SSB RSRP Note3 | 1,2 | dBm/SSB SCS | -94.65 | -94.65 | -94.65 | -84.65 |
|  | 3 |  | -91.65 | -91.65 | -91.65 | -91.65 |
| Io Note3 | 1,2 | dBm/9.36 MHz | -63.69 | -63.69 | -63.69 | -56.28 |
|  | 3 | dBm/38.16 MHz | -57.59 | -57.59 | -57.59 | -50.19 |
| Propagation condition | 1~3 |  | AWGN | | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 3: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 4: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.. | | | | | | |

##### A.6.6.y.1.3 Test Requirements

During T1 The UE shall send inter-frequency L1-RSRP report every 80 slots. No later than 80 ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report of Cell 2. The RSRP report during T2 shall be larger than that during T1. These reported measurement report shall meet the absolute accuracy requirement in clause 10.1.19y. The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

End of Change 12

Start of Change 13

### A.6.6.z LTM Inter-frequency L1-RSRP measurement without measurement gap

#### A.6.6.z.1 Inter-frequency SSB based L1-RSRP measurement without measurement gap

##### A.6.6.z.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE supporting inter-frequency L1-RSRP measurements without gap makes correct reporting of inter-frequency L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.15.6, with the testing configurations for NR serving cells in Table A.6.6.z.1.1-1.

Table A.6.6.z.1.1-1: Applicable NR configurations for SSB based inter-frequency L1-RSRP measurement without measurement gap in test

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations  Note 2: Target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

##### A.6.6.z.1.2 Test parameters

There are two cells in the test, the FR1 PCell (Cell 1) on NR RF channel 1 and Cell 2 as neighbour cell in FR1 on NR RF channel 2. The SSB of Cell 2 is completely within UE’s active BWP BW. The RBs containing SSB from Cell 1 and Cell 2 should be different in frequency location within the cell bandwidth. The test parameters are given in Table A.6.6.z.1.2-1 and Table A.6.6.z.1.2-2 below.

There are two tests in the test case, test 1 and test 2:

* In test 1, time offset between cells is within CP length.
* In test 2, time offset between cells is larger than CP length.

UE not capable of [RTD>CP] is only required to pass test 1. Otherwise, it is only required to pass test 2.

The test consists of two successive time periods, with time duration of T1 and T2 respectively. There is no measurement gap configured in the test.

Prior to the start of the time duration T1,

- UE is connected to Cell 1 (PCell) on RF channel 1 (PCC).

- A measurement object is configured for RF channel 2, and it is indicated to the UE that event-triggered reporting with Event A3 is used. Before the start of the T1, event is triggered, and UE has sent a measurement report for the Cell 2 with SSB Index.

- UE is provided with *LTM-Candidate-r18* for Cell 2*.*

- UE is configured with SSB-based L1-RSRP measurements and periodic L1-RSRP measurement reports on candidate cell (Cell 2) in PUCCH format 2.

At the beginning of T2, SSB\_RP of Cell 2 changes to a different value from T1. T2 starts at the beginning of a frame with an even SFN.

**Table A.6.6.z.1.2-1: General test parameters for SSB based inter-frequency L1-RSRP measurement without measurement gap in test**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | | **Comment** |
| Test 1 | Test 2 |  |
| Active cell | |  | Cell 1 | |  |
| Neighbour cell | |  | Cell 2 | | Cell 2 is candidate cell |
| RF Channel Number | |  | 1: Cell 1  2: Cell 2 | |  |
| A3-Offset | | dB | -6 | |  |
| Hysteresis | | dB | 0 | |  |
| Time To Trigger | | s | 0 | |  |
| Filter coefficient | |  | 0 | | L3 filtering is not used |
| maxNrofRS-IndexesToReport | |  | 1 | |  |
| includeBeamMeasurements | |  | True | |  |
| Time offset between cells | | μs | 2 | 20 |  |
| DRX | |  | OFF | |  |
| LTM-CSI-ReportConfig | L1-RSRP reporting period | slot | 80 | | Periodic L1-RSRP reporting configured |
| nrOfReportedCells |  | n1 | | Report candidate cell’s (Cell 2) L1-RSRP measurement results |
| nrOfReportedRS-PerCell |  | n1 | |
| spCellInclusion |  | N/A | |
| ltm-ConfigComplete | |  | True | | Candidate cell’s configuration is complete configuration |
| T1 | | s | 0.3 | |  |
| T2 | | s | 0.5 | |  |

**Table A.6.6.z.1.2-2: Cell specific test parameters for SSB based inter-frequency L1-RSRP measurement without measurement gap in test**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Cell 1 | | | Cell 2 | |
|  | | |  | T1 | T2 | | T1 | T2 |
| NR RF Channel Number | | |  | 1 | | 2 | | |
| SSB GSCN | | |  | freq1 | | freq2 | | |
| 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 | | | | |
| BWchannel | | Config 1 | MHz | 10: NRB,c = 52 | | | | |
|  | | Config 2 |  | 10: NRB,c = 52 | | | | |
|  | | Config 3 |  | 40: NRB,c = 106 | | | | |
| BWP BW | | Config 1 | MHz | 10: NRB,c = 52 | | | | |
|  | | Config 2 |  | 10: NRB,c = 52 | | | | |
|  | | Config 3 |  | 40: NRB,c = 106 | | | | |
| PDSCH Reference | | Config 1 |  | SR.1.1 FDD | | N/A | | |
| measurement channel | | Config 2 |  | SR.1.1 TDD | | N/A | | |
|  | | Config 3 |  | SR.2.1 TDD | | N/A | | |
| CORESET Reference Channel | | Config 1 |  | CR.1.1 FDD | | N/A | | |
|  | | Config 2 | CR.1.1 TDD | | N/A | | |
|  | | Config 3 | CR.2.1 TDD | | N/A | | |
| CP length | |  |  | Normal | | | | |
| 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 | | Config 1 |  | SMTC.2 | | SMTC.5 | | |
| Config 2,3 |  | SMTC.1 | | SMTC.4 | | |
| SSB Configuration | | Config 1,2 |  | SSB.1 FR1 | | SSB.5 FR1 | | |
|  | | Config 3 |  | SSB.2 FR1 | | SSB.6 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 | | | | |
| BWP configuration | | Initial DL BWP |  | DLBWP.0.1 | | NA | | |
|  | | Dedicated DL BWP |  | DLBWP.1.1 | | NA | | |
|  | | Initial UL BWP |  | ULBWP.0.1 | | NA | | |
|  | | Dedicated UL BWP |  | ULBWP.1.1 | | NA | | |
| 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) | | |
| Note2 | | | dBm/15kHz | -101 | | | | |
| Note2 | Config 1,2 | | dBm/SCS | -101 | | | | |
|  | Config 3 | |  | -98 | | | | |
|  | | | dB | -1.76 | -0.19 | | -1.76 | -0.19 |
|  | | | dB | 3 | 14.5 | | 3 | 14.5 |
| SSB\_RP | Config 1,2 | | dBm/SCS | -98 | -87.5 | | -98 | -87.5 |
|  | Config 3 | | dBm/SCS | -95 | -84.5 | | -95 | -84.5 |
| IoNote3 | Config 1,2 | | dBm/  9.36MHz | -66.07 | -56.44 | | -66.07 | -56.44 |
|  | Config 3 | | dBm/  38.16MHz | -59.96 | -50.34 | | -59.96 | -50.34 |
| 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  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | |

##### A.6.6.z.1.3 Test Requirements

The UE shall send L1-RSRP report every 80 slots. No later than 20 ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report of Cell 2 while meeting the absolute accuracy requirement in clause 10.1.19.x.y and relative accuracy requirement in clause 10.1.19.x.y.

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

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

End of Change 14

Start of Change 15

### A.6.7.x LTM L1-RSRP measurement

#### A.6.7.x.1 Inter-frequency L1-RSRP accuracy requirements for neighbour cell in FR1

##### A.6.7.x.1.1 Test Purpose and Environment

The purpose of this test is to verify that the inter-frequency L1-RSRP measurement accuracy on neigbor cell is within the specified limits. This test will verify the requirements in clause 9.15.5 and clause [10.1.19Y] for inter-frequency L1-RSRP measurements based on SSB with the testing configurations for NR cells in Table A.6.7.x.1.1-1.

Table A.6.7.x.1.1-1: Applicable NR configurations for FR1 SSB based inte-frequency L1-RSRP test

|  |  |
| --- | --- |
| Config | Description |
| 1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations in each supported band  Note 2: Target NR cell has the same SCS, BW and deplex mode as NR serving cell. | |

##### A.6.7.x.1.2 Test parameters

In this set of test cases there are two cells: NR Cell 1 as PCell in FR1 on NR RF channel 1 and NR Cell 2 as neighbour cell in FR1 on NR RF channel 2. The test parameters for the Cell 2 are given in Table A.6.7.x.1.2-1 below. The absolute and relative accuracy of L1-RSRP measurements are tested by using the parameters in Table A.6.7.x.1.2-1.

Measurement gap pattern configuration defined in Table A.6.7.x.1.2-1 is provided. Before the test,

- UE is connected to Cell 1 (PCell) on RF channel 1 (PCC)

- UE is configured one SSB resource set with one SSB resource on Cell 2

- A measurement object is configured for the RF channel 2, and it is indicated to the UE that event-triggered reporting with Event A3 is used. Before the test, event is triggered, and UE has sent a measurement report for the Cell 2 with SSB Index.

- UE is provided with *LTM-Candidate-r18* for Cell 2*.*

- UE is configured with SSB-based L1-RSRP measurements and periodic L1-RSRP measurement reports on candidate cell (Cell 2) in PUCCH format 2.

Table A.6.7.x.1.2-1: FR1 inter-frequency SSB based L1-RSRP test parameters

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Config | Unit | Test 1 | | Test 2 | |
|  | |  |  | Cell1 | Cell 2 | Cell 1 | Cell 2 |
| SSB GSCN | | 1~3 |  | freq1 | freq2 | freq1 | freq2 |
| Duplex mode | | 1 |  | FDD | | FDD | |
|  | | 2 |  | TDD | | TDD | |
|  | | 3 |  | TDD | | TDD | |
| Gap Pattern Id | | 1~3 |  | 0 | | | |
| Measurement gap offset | | 1~3 |  | 39 | | | |
| TDD Configuration | | 1 |  | N/A | | N/A | |
|  | | 2 |  | TDDConf.1.1 | | TDDConf.1.1 | |
|  | | 3 |  | TDDConf.2.1 | | TDDConf.2.1 | |
| BWchannel | | 1 | MHz | 10: NRB,c = 52 | | 10: NRB,c = 52 | |
|  | | 2 |  | 10: NRB,c = 52 | | 10: NRB,c = 52 | |
|  | | 3 |  | 40: NRB,c = 106 | | 40: NRB,c = 106 | |
| PDSCH Reference measurement channel | | 1 |  | SR.1.1 FDD | - | SR.1.1 FDD | - |
|  | | 2 |  | SR.1.1 TDD | - | SR.1.1 TDD | - |
|  | | 3 |  | SR.2.1 TDD | - | SR.2.1 TDD | - |
| RMSI CORESET Reference Channel | | 1 |  | CR.1.1 FDD | - | CR.1.1 FDD | - |
|  | | 2 |  | CR.1.1 TDD | - | CR.1.1 TDD | - |
|  | | 3 |  | CR.2.1 TDD | - | CR.2.1 TDD | - |
| Dedicated CORESET Reference Channel | | 1 |  | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
|  | | 2 |  | CCR.1.1 TDD | - | CCR.1.1 TDD | - |
|  | | 3 |  | CCR.2.1 TDD | - | CCR.2.1 TDD | - |
| SSB configuration | | 1 |  | SSB.1 FR1 | | SSB.1 FR1 | |
|  | | 2 |  | SSB.1 FR1 | | SSB.1 FR1 | |
|  | | 3 |  | SSB.2 FR1 | | SSB.2 FR1 | |
| OCNG Patterns | | 1~3 |  | OP.1 | | OP.1 | |
| Initial BWP Configuration | | 1~3 |  | DLBWP.0.1  ULBWP.0.1 | | DLBWP.0.1  ULBWP.0.1 | |
| 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 | - |
| Dedicated BWP configuration | | 1~3 |  | DLBWP.1.1  ULBWP.1.1 | | DLBWP.1.1  ULBWP.1.1 | |
| SMTC configuration | | 1~3 |  | SMTC.1 | | SMTC.1 | |
| reportConfigType | | 1~3 |  | periodic | | periodic | |
| reportQuantity | | 1~3 |  | ssb-Index-RSRP | | ssb-Index-RSRP | |
| Number of reported RS | | 1~3 |  | 1 | | 1 | |
| L1-RSRP reporting period | | 1~3 |  | slot80 | | slot80 | |
| EPRE ratio of PSS to SSS | | 1~3 | dB | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | |  |  |  | |  | |
| EPRE ratio of PBCH to PBCH DMRS | |  |  |  | |  | |
| EPRE ratio of PDCCH DMRS to SSS | |  |  |  | |  | |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |  |  | |  | |
| EPRE ratio of PDSCH DMRS to SSS | |  |  |  | |  | |
| EPRE ratio of PDSCH to PDSCH DMRS | |  |  |  | |  | |
| EPRE ratio of OCNG DMRS to SSSNote 1 | |  |  |  | |  | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |  |  |  | |  | |
| Note2 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 1~3 | dBm/15kHz | -94.65 | | ( for Channel 2 +8dB) | -117 |
|  | NR\_FDD\_FR1\_B |  |  |  | | -116.5 |
|  | NR\_TDD\_FR1\_C |  |  |  | | -116 |
|  | NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D |  |  |  | | -115.5 |
|  | NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E |  |  |  | | -115 |
|  | NR\_FDD\_FR1\_F |  |  |  | | -114.5 |
|  | NR\_FDD\_FR1\_G |  |  |  | | -114 |
|  | NR\_FDD\_FR1\_H |  |  |  | | -113.5 |
|  | NR\_FDD\_FR1\_N |  |  |  | | -110.5 |
| Note2 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 1,2 | dBm/SSB SCS | -94.65 | | ( for Channel 2 +8dB) | -117 |
|  | NR\_FDD\_FR1\_B |  |  |  | | -116.5 |
|  | NR\_TDD\_FR1\_C |  |  |  | | -116 |
|  | NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D |  |  |  | | -115.5 |
|  | NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E |  |  |  | | -115 |
|  | NR\_FDD\_FR1\_F |  |  |  | | -114.5 |
|  | NR\_FDD\_FR1\_G |  |  |  | | -114 |
|  | NR\_FDD\_FR1\_H |  |  |  | | -113.5 |
|  | NR\_FDD\_FR1\_N |  |  |  | | -110.5 |
|  | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 3 |  | -91.65 | | ( for Channel 2 +8dB) | -114 |
|  | NR\_FDD\_FR1\_B |  |  |  | | -113.5 |
|  | NR\_TDD\_FR1\_C |  |  |  | | -114 |
|  | NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D |  |  |  | | -112.5 |
|  | NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E |  |  |  | | -112 |
|  | NR\_FDD\_FR1\_F |  |  |  | | -111.5 |
|  | NR\_FDD\_FR1\_G |  |  |  | | -111 |
|  | NR\_FDD\_FR1\_H |  |  |  | | -110.5 |
|  | NR\_FDD\_FR1\_N |  |  |  | | -107.5 |
|  | | 1~3 | dB | 10 | 10 | 13 | -3 |
| SSB RSRP Note3 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 1,2 | dBm/SSB SCS | -84.65 | | (RSRP for Cell 2 +25dB) | -120 |
|  | NR\_FDD\_FR1\_B |  |  |  | | -119.5 |
|  | NR\_TDD\_FR1\_C |  |  |  | | -119 |
|  | NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D |  |  |  | | -118.5 |
|  | NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E |  |  |  | | -118 |
|  | NR\_FDD\_FR1\_F |  |  |  | | -117.5 |
|  | NR\_FDD\_FR1\_G |  |  |  | | -117 |
|  | NR\_FDD\_FR1\_H |  |  |  | | -116.5 |
|  | NR\_FDD\_FR1\_N |  |  |  | | -113.5 |
|  | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 3 |  | -81.65 | | (RSRP for Cell 2 +25dB) | -117 |
|  | NR\_FDD\_FR1\_B |  |  |  | | -116.5 |
|  | NR\_TDD\_FR1\_C |  |  |  | | -116 |
|  | NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D |  |  |  | | -115.5 |
|  | NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E |  |  |  | | -115 |
|  | NR\_FDD\_FR1\_F |  |  |  | | -114.5 |
|  | NR\_FDD\_FR1\_G |  |  |  | | -114 |
|  | NR\_FDD\_FR1\_H |  |  |  | | -113.5 |
|  | NR\_FDD\_FR1\_N |  |  |  | | -110.5 |
| Io Note3 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 1,2 | dBm/9.36 MHz | -56.28 | | (Io for Channel 2 +19.75dB) | -87.28 |
|  | NR\_FDD\_FR1\_B |  |  |  | | -86.78 |
|  | NR\_TDD\_FR1\_C |  |  |  | | -86.28 |
|  | NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D |  |  |  | | -85.78 |
|  | NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E |  |  |  | | -85.28 |
|  | NR\_FDD\_FR1\_F |  |  |  | | -84.78 |
|  | NR\_FDD\_FR1\_G |  |  |  | | -84.28 |
|  | NR\_FDD\_FR1\_H |  |  |  | | -83.78 |
|  | NR\_FDD\_FR1\_N |  |  |  | | -80.78 |
|  | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 3 | dBm/38.16 MHz | -50.19 | | (Io for Channel 2 +19.75dB) | -81.19 |
|  | NR\_FDD\_FR1\_B |  |  |  | | -80.69 |
|  | NR\_TDD\_FR1\_C |  |  |  | | -80.19 |
|  | NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D |  |  |  | | -79.69 |
|  | NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E |  |  |  | | -79.19 |
|  | NR\_FDD\_FR1\_F |  |  |  | | -78.69 |
|  | NR\_FDD\_FR1\_G |  |  |  | | -78.19 |
|  | NR\_FDD\_FR1\_H |  |  |  | | -77.69 |
|  | NR\_FDD\_FR1\_N |  |  |  | | -74.69 |
|  | | 1~3 | dB | 10 | 10 | 13 | -3 |
| Propagation condition | | 1~3 |  | AWGN | | AWGN | |
| Antenna configuration | | 1~3 |  | 1x2 | | 1x2 | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification. | | | | | | | |

##### A.6.7.x.1.3 Test Requirements

The inter-frequency L1-RSRP measurement accuracy for SSB resource reported by UE in L1-RSRP report (SSB#0 of Cell 2) shall fulfil the requirements in clauses 10.1.19y.

End of Change 15

Start of Change 16

A.7.3.2.x LTM PDCCH-order Random Access

A.7.3.2.x.1 PDCCH-order RACH on neighbor cell in FR2 when RACH BW is within active BWP

A.7.3.2.x.1.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR2-NR FR2 PDCCH-ordered RACH to an intra-frequency candidate cell in FR2 for LTM. The interruption requirements specified in clause 8.2.2.2.20. This test is for UE supporting PDCCH-ordered RACH to an intra-frequency candidate cell, whose SSB is within active BWPs of the UE.

A.7.3.2.x.1.2 Test Parameters

Two cells are deployed in the test, which are FR2 PCell (Cell 1) and a FR2 neighbour cell (Cell 2) on the same frequency as the PCell. Test configurations are given in table A.7.3.2.x.1.2-1. Both PDCCH order RACH delay and transmit timing requirement are tested by using the parameters in table A.7.3.2.x.1.2-2, and A.7.3.2.x.1.2-3.

There are two tests in the test case, test 1 and test 2:

* In test 1, joint TCI state configuration as defined in Table A.7.3.2.x.1.2-2 is provided for UE that supports *ltm-BeamIndicationJointTCI-r18*.
* In test 2, separate TCI state configuration as defined in Table A.7.3.2.x.1.2-2 for test 2 is provided for UE that supports *ltm-BeamIndicationSeparateTCI-r18* and does not support *ltm-BeamIndicationJointTCI-r18*.

If a UE supports *ltm-BeamIndicationSeparateTCI-r18* and does not support *ltm-BeamIndicationJointTCI-r18*, it is only required to pass test 2. Otherwise, it is only required to pass test 1.

The test consists of two successive time periods, with time durations of T1 and T2 respectively. No gap patterns are configured in the test case.

Prior to the start of the time duration T1,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC).

- UE is provided with *LTM-Candidate-r18* for Cell 2*.*

- A measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

- UE is configured with SSB-based L1-RSRP measurements and periodic L1-RSRP measurement reports on candidate cell (Cell 2) in PUCCH format 2.

- The UE has performed L3 measurement and SSB based L1-RSRP measurement on Cell 2.

T1 starts from UE transmitting a valid L1 report on Cell 2. After receiving the first L1 report on Cell 2 during T1, the network sends TCI state activation MAC CE to active TCI state of Cell 2 in no later than 100ms.

* In test 1, CandidateTCI-State#1 is activated.
* In test 2, CandidateTCI-State#1 and CandidateTCI-UL-State#1 are activated.
* For UE incapable of early TCI state activation, network shall not send TCI state activation MAC CE to active TCI state of Cell 2.

The start of T2 is the instant when PDCCH order to trigger PRACH transmission on Cell 2 is sent to the UE.

**Table A.7.3.2.x.1.2-1: PDCCH order RACH on Neighbor cell in FR1 test configurations**

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | Source cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode  Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

**Table A.7.3.2.x..2.2-2: General test parameters for PDCCH order RACH in FR2**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | | **Comment** |
| **Test 1** | **Test 2** |
| Initial conditions | Active cell |  | Cell 1 | |  |
|  | Neighbouring cell |  | Cell 2 | | Cell 2 is the candidate cell |
| Final condition | Active cell |  | Cell 1 | | After transmitting PRACH on Cell 2, UE shall be back to Cell 1. |
| A3-Offset | | dB | 0 | |  |
| Hysteresis | | dB | 0 | |  |
| Time To Trigger | | s | 0 | |  |
| Filter coefficient | |  | 0 | | L3 filtering is not used |
| DRX | |  | OFF | | DRX is not used |
|  | |  |  | |  |
| Time offset between cells | |  | 0.3 μs | | RTD between cells is less than CP |
| deriveSSB-IndexFromCell | |  | Enabled | |  |
| EarlyUL-SyncConfig | frequencyInfoUL |  | NR RF Channel Number 1 | | Same as Cell 1 |
| PRACH configuration |  | FR2 PRACH configuration 5 | | RACH bandwidth is within active UL BWP of Cell 1 |
| bwp-GenericParameters |  | ULBWP.0.1 | |
| n-TimingAdvanceOffset | Tc | N/A | |  |
| LTM-CSI-ReportConfig | L1-RSRP reporting period | slot | 320 | | Periodic L1-RSRP reporting configured |
| nrOfReportedCells |  | n1 | | Report candidate cell’s (Cell 2) L1-RSRP measurement results. |
| nrOfReportedRS-PerCell |  | n1 | |
|  | spCellInclusion |  | N/A | |
| ltm-DL-OrJointTCI-StateToAddModList | #1  CandidateTCI-State |  | DLorJoint TCI.State.0 | DLorJoint TCI.State.2 | As specified in clause A.3.16B.  Configured for early TCI state activation. |
| ltm-UL-TCI-StatesToAddModList | #1  CandidateTCI-UL-State#0 |  | N/A | UL TCI.State.0 | As specified in clause A.3.16B.  Configured for early TCI state activation. |
| ltm-ConfigComplete | |  | True | | Candidate cell’s configuration is complete configuration |
| T1 | | s | 0.3 | |  |
| T2 | | s | ≤0.5 | |  |

**Table A.7.3.2.x..2.2-3: Cell specific test parameters for PDCCH order RACH test case in FR2**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Cell 1** | | **Cell 2** | |
|  | | |  | **T1** | **T2** | **T1** | **T2** |
| Assumption for UE beamsNote 6 | | |  | Rough | | Rough | |
| AoA setup | | |  | Setup 1 as defined in A.3.15 | | | |
| NR RF Channel Number | | |  | **1** | | **1** | |
| Duplex mode | | |  | TDD | | | |
| TDD configuration | | |  | TDDConf.3.1 | | | |
| BWchannel | | | MHz | 100: NRB,c = 66 | | | |
| BWP BW | | | MHz | 100: NRB,c = 66 | | | |
| Data RBs allocated | | |  | 66 | | | |
| DRx Cycle | | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | | |  | SR3.1 TDD | | | |
| RMSI CORESET Reference Channel | | |  | CR3.1 TDD | | | |
| Control Channel RMC | | |  | CCR.3.1 TDD | | | |
| OCNG Patterns | | |  | O P. 1 | | | |
| SMTC Configuration | | |  | SMTC pattern 1 | | | |
| SSB Configuration | | |  | SSB.3 FR2 | | | |
| PDSCH/PDCCH subcarrier spacing | | | kHz | 120 | | | |
| PUCCH/PUSCH subcarrier spacing | | | kHz | 120 | | | |
| PRACH configuration | | |  | FR2 PRACH configuration 1 | | | |
| TRS configuration | | |  | TRS.2.1 TDD | | | |
| PDSCH/PDCCH TCI state | | |  | TCI.State.2 | | | |
| BWP configuraiton | | Initial DL BWP |  | DLBWP.0.1 | | | |
|  | | Dedicated DL BWP |  | DLBWP.1.1 | | | |
|  | | Initial UL BWP |  | ULBWP.0.1 | | | |
|  | | Dedicated UL BWP |  | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | |  |  | |  | |
| EPRE ratio of PBCH to PBCH DMRS | | |  |  | |  | |
| EPRE ratio of PDCCH DMRS to SSS | | |  |  | |  | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |  |  | |  | |
| EPRE ratio of PDSCH DMRS to SSS | | |  |  | |  | |
| EPRE ratio of PDSCH to PDSCH | | |  |  | |  | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |  |  | |  | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |  |  | |  | |
| Note2 | | | dBm/15kHz | -104.7 | | -104.7 | |
| Note2 |  | | dBm/SCS | -95.7 | | -95.7 | |
|  | | | dB | -1.8 | | 0 | |
|  | | | dB | 6 | | 7 | |
| SSB\_RP | | | dBm/SCS | -89.7 | | -88.7 | |
| IoNote3 | | | dBm/  95.04MHz | -56.7 | | -56.7 | |
| 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  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone  Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | | |

A.7.3.2.x.1.3 Test Requirements

The UE shall transmit the PRACH to Cell 2 in the first available PRACH occasion after + 0.25ms + from the beginning of time period T2. After transmitting PRACH on Cell 2, UE shall be back to Cell 1.

NOTE: The PDCCH order RACH delay can be expressed as: , where:

- is a time duration of symbols corresponding to a PUSCH preparation time for UE processing capability 1 assuming corresponds to the smallest SCS configuration between the SCS configuration of the PDCCH order and the SCS configuration of the corresponding PRACH transmission and is specified in Table 6.4-1 in 38.214 [26].

- = 0, = 0, = 0

- = 0.25ms

- [ is the time to first gap occasion after [UE decoding PDCCH-order]].

During T2, interruption on Cell 1 UL shall not happen outside the overlapped slot to transmit PRACH and symbols from the last or first symbol of PRACH occasion as defined in clause 8.1 in 38.213 [3], where N=4. During T2, interruption on Cell 1 DL shall not occur outside the overlapped slot to transmit PRACH.

The test equipment will verify that the timing of PRACH transmission on Cell 2 is within (NTA + NTA\_offset) ×Tc ± Te of the first detected path of DL SSB of Cell 2.

a. The NTA\_offset value (in Tc units) is 13792.

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

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

A.7.3.2.x.2 PDCCH-order RACH on inter-frequency neighbor cell in FR2

A.7.3.2.x.2.1 Test Purpose and Environment

This test is to verify the requirement for PDCCH-order RACH on neighbour cell in FR2 when RACH bandwidth is outside any configured UL BWP specified in clause 8.1 in 38.213 [3], UE transmit timing in clause 7.1 and interruption in clause for UE supporting [RACH-based early TA acquisition], [RF/BB preparation time for PDCCH-order RACH] and [Interruption due to RF retuning for PDCCH- ordered RACH].

A.7.3.2.x.2.2 Test Parameters

In this test, there are two cells: NR Cell 1 as PCell in FR2 on NR RF channel 1 and NR Cell 2 as neighbour cell in FR2 on NR RF channel 2. Test configurations are given in table A.7.3.2.x.2.2-1. Both PDCCH order RACH delay, transmit timing requirement and the interruption requirements are tested by using the parameters in table A.7.3.2.x.2.2-2, and A.7.3.2.x.2.2-3.

The test consists of two successive time periods, with time durations of T1 and T2 respectively.

Prior to the start of the time duration T1,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC).

- UE is provided with *LTM-Candidate-r18* for Cell 2*.*

- A measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A4 is used.

- UE is configured with SSB-based L1-RSRP measurements and periodic L1-RSRP measurement reports on candidate cell (Cell 2) in PUCCH format 2.

- The UE has reported L3 measurement results and performed SSB based L1-RSRP measurement on Cell 2.

T1 starts from UE transmitting a valid L1 report on Cell 2. After T1, test equipment sends PDCCH order to trigger RACH transmission. The start of T2 is the instant when PDCCH order to trigger PRACH transmission on Cell 2 is received.

**Table A.7.3.2.x.2.2-1: PDCCH order RACH on inter-frequency neighbor cell in FR2 test configurations**

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | Source cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode  Candidate cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

**Table A.7.3.2.x.2.2-2: General test parameters for PDCCH order RACH in FR2**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| Initial conditions | Active cell |  | Cell 1 |  |
|  | Neighbouring cell |  | Cell 2 | Cell 2 is the candidate cell |
| Final condition | Active cell |  | Cell 1 | After transmitting PRACH on Cell 2, UE shall be back to Cell 1. |
| *a4-Threshold* | | dBm | -110 | Cell 2 |
| Hysteresis | | dB | 0 |  |
| Time To Trigger | | ms | 0 |  |
| Filter coefficient | |  | 0 | L3 filtering is not used |
| includeBeamMeasurements | |  | True |  |
| Gap Pattern Id | |  | 13 | As specified in Table 9.1.2-1. |
| Measurement gap offset | |  | 39 |  |
| DRX | |  | OFF | DRX is not used |
| Time offset between cells | |  | 0.3 μs |  |
| deriveSSB-IndexFromCell | |  | Enabled |  |
| EarlyUL-SyncConfig | frequencyInfoUL |  | NR RF Channel Number 2 | Cell 2 |
| PRACH configuration |  | FR2 PRACH configuration 5 |  |
| bwp-GenericParameters |  | ULBWP.0.1 |
| n-TimingAdvanceOffset | Tc | N/A |  |
| LTM-CSI-ReportConfig | L1-RSRP reporting period | slot | 320 | Periodic L1-RSRP reporting configured |
| nrOfReportedCells |  | n1 | Report candidate cell’s (Cell 2) L1-RSRP measurement results. |
| nrOfReportedRS-PerCell |  | n1 |
|  | spCellInclusion |  | N/A |
| ltm-ConfigComplete | |  | True | Candidate cell’s configuration is complete configuration |
| T1 | | s | 0.3 |  |
| T2 | | s | ≤0.5 |  |

**Table A.7.3.2.x.2.2-3: Cell specific test parameters for PDCCH order RACH test case**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Test configuration** | **Cell 1** | | **Cell 2** | |
|  | |  |  | **T1** | **T2** | **T1** | **T2** |
| AoA setup | |  | Config 1 | Setup 1 as specified in clause A.3.15 | | | |
| Beam AssumptionNote 7 | |  | Config 1 | Rough | | Rough | |
| NR RF Channel Number | |  | Config 1 | 1 | | 2 | |
| Duplex mode | |  | Config 1 | TDD | | TDD | |
| TDD configuration | |  | Config 1 | TDDConf.3.1 | | TDDConf.3.1 | |
| BWchannel | | MHz | Config 1 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| Data RBs allocated | |  | Config 1 | 66 | | 66 | |
| BWP BW | | MHz | Config 1 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| BWP configuration | Initial DL BWP |  | Config 1 | DLBWP.0.1 | | N/A | |
|  | Initial UL BWP |  |  | ULBWP.0.1 | | N/A | |
|  | Dedicated DL BWP |  |  | DLBWP.1.1 | | N/A | |
|  | Dedicated UL BWP |  |  | ULBWP.1.1 | | N/A | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | |  | Config 1 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | |  | Config 1 | SR.3.1 TDD | | N/A | |
| RMSI CORESET Reference Channel | |  | Config 1 | CR.3.1 TDD | | N/A | |
| Control Channel RMC | |  | Config 1 | CCR.3.1 TDD | | N/A | |
| SMTC configuration | |  | Config 1 | SMTC.1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1 | 120 | | 120 | |
| PUCCH/PUSCH subcarrier spacing | | kHz | Config 1 | 120 | | 120 | |
| TRS configuration | |  | Config 1 | TRS.2.1 TDD | | TRS.2.1 TDD | |
| PDSCH/PDCCH TCI state | |  | Config 1 | TCI.State.2 | | N/A | |
| EPRE ratio of PSS to SSS | |  |  |  | |  | |
| EPRE ratio of PBCH DMRS to SSS | |  |  |  | |  | |
| EPRE ratio of PBCH to PBCH DMRS | |  |  |  | |  | |
| EPRE ratio of PDCCH DMRS to SSS | |  |  |  | |  | |
| EPRE ratio of PDCCH to PDCCH DMRS | |  | Config 1 | 0 | | 0 | |
| EPRE ratio of PDSCH DMRS to SSS | |  |  |  | |  | |
| EPRE ratio of PDSCH to PDSCH | |  |  |  | |  | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  |  | |  | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  |  | |  | |
| Note 3 | | dB | Config 1 | 5 | 5 | 5 | 5 |
| Note2 | | dBm/15 kHz | Config 1 | -104.7 | -104.7 | -104.7 | -104.7 |
| Note2 | | dBm/SCS | Config 1 | -95.7 | -95.7 | -95.7 | -95.7 |
| SSB\_RP Note 3 | | dBm/SCS Note5 | Config 1 | -90.7 | -90.7 | -90.7 | -90.7 |
| IoNote3 | | dBm/95.04 MHz Note5 | Config 1 | -60.5 | -60.5 | -60.5 | -60.5 |
| Propagation Condition | |  | Config 1 | AWGN | | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SSB\_RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone  Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | | |

A.7.3.2.x.2.3 Test Requirements

The UE shall transmit the PRACH to Cell 2 in the first available PRACH occasion after + 0.25ms + + from the beginning of time period T2. After transmitting PRACH on Cell 2, UE shall be back to Cell 1.

NOTE: The PDCCH order RACH delay can be expressed as: , where:

- is a time duration of symbols corresponding to a PUSCH preparation time for UE processing capability 1 assuming corresponds to the smallest SCS configuration between the SCS configuration of the PDCCH order and the SCS configuration of the corresponding PRACH transmission and is specified in Table 6.4-1 in 38.214 [26].

- = 0, = 0

- is reported in [UE capability of RF/BB preparation time for PDCCH-order RACH]

- = 0.25ms

- [ is the time to first gap occasion after [UE decoding PDCCH-order]].

During T2, interruption on Cell 1 shall not happen outside ceil (Y/NR Slot length) +1 slots before and after PRACH transmission and the same slot of PRACH, where Y as reported in [UE capability xx],

The test equipment will verify that the timing of PRACH transmission on Cell 2 is within (NTA + NTA\_offset) ×Tc ± Te of the first detected path of DL SSB of Cell 2.

a. The NTA\_offset value (in Tc units) is 13792.

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

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

End of Change 16

Start of Change 17

### A.7.3.x LTM PCell Switch

#### A.7.3.x.1 RACH based Intra-frequency cell switch from FR2 to FR2

##### A.7.3.x.1.1 Test Purpose and Environment

This test is to verify the intra frequency RACH based LTM PCell switch requirements from NR FR2 to NR FR2 specified in clause 6.3.1 for both with and without early TCI state activation.

##### A.7.3.x.1.2 Test Parameters

Two cells are deployed in the test, which are FR2 PCell (Cell 1) and a FR2 neighbour cell (Cell 2) on the same frequency as the PCell. Test configurations are given in table A.7.3.x.1.2-1. Both cell switch delay and interruption length are tested by using the parameters in table A.7.3.x.1.2-2 and A.7.3.x.1.2-3.

The test consists of 4 tests, and UE is required to pass one among Test 1A, Test 1B, Test 2A and Test 2B.

- Test 1: for a UE supporting *ltm-MAC-CE-JointTCI-r18* and/or *ltm-MAC-CE-SeparateTCI-r18*

- Test 1A: for a UE supporting *ltm-MAC-CE-JointTCI-r18*.

- Test 1B: for a UE supporting *ltm-MAC-CE-SeparateTCI-r18* and does not support *ltm-MAC-CE-JointTCI-r18*.

- Test 2: for a UE not supporting *ltm-MAC-CE-JointTCI-r18* and *ltm-MAC-CE-SeparateTCI-r18*

- Test 2A: for a UE supporting *ltm-BeamIndicationJointTCI-r18*.

- Test 2B: for a UE supporting *ltm-BeamIndicationSeparateTCI-r18* and does not support *ltm-BeamIndicationJointTCI-r18*.

The test consists of four successive time periods, with time durations of T1, T2, T3 and T4, respectively. No gap patterns are configured in the test case.

During T1, for Test 1A, 1B, 2A and 2B:

- A measurement object is configured for the frequency of the Cell 2, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

- T1 ends with UE reporting an L3 measurement result of Cell 2 to Cell 1.

During T2, for Test 1A, 1B, 2A and 2B:

- At the start of T2, UE is provided with *LTM-Candidate-r18* for Cell 2

- Joint TCI state configuration as defined in Table A.7.3.x.1.2-2 for Test 1A and Test 2A are provided.

- Separate TCI state configuration as defined in Table A.7.3.x.1.2-2 for Test 1B and Test 2B are provided.

- UE is configured with SSB-based L1-RSRP measurements and periodic L1-RSRP measurement reports on candidate cell (Cell 2) in PUCCH format 2.

- T2 ends with UE reporting a valid L1-RSRP result of Cell 2.

During T3, for Test 1A and 1B:

- At the start of T3, UE receives candidate cell TCI state activation MAC CE for Cell 2.

- In Test 1A, *CandidateTCI-State#1* is activated.

- In Test 1B, *CandidateTCI-State#1* and *CandidateTCI-UL-State#1* is activated.

- T3 ends 50 ms after the candidate cell TCI state activation MAC CE transmission.

- In Test 2A and 2B, T3 is skipped.

During T4, for Test 1A, 1B, 2A and 2B:

- The start of T4 is the instant when the last TTI containing LTM cell switch command MAC CE is sent by Cell 1 to the UE.

- In the cell switch command, Cell 2 is the target cell. Contention-Free Random-Access Resources are indicated. The field of Timing Advance Command is set to FFF.

- In test 1A, CandidateTCI-State#2 is indicated.

- In test 1B, CandidateTCI-State#2 and CandidateTCI-UL-State#1 are indicated.

- In test 2A, CandidateTCI-State#1 is indicated.

- In test 2B, CandidateTCI-State#1 and CandidateTCI-UL-State#1 are indicated.

- T4 ends upon the reception of PRACH at Cell 2.

Table A.7.3.x.1.2-1: Intra-frequency cell switch from FR2 to FR2 test configurations

|  |  |
| --- | --- |
| Config | Description |
| 1 | Source cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode  Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Table A.7.3.x.1.2-2: General test parameters for Intra-frequency cell switch from FR2 to FR2

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | | | | Comment |
| Test 1A | Test 1B | Test 2A | Test 2B |
| Initial conditions | Active cell |  | Cell 1 | | | |  |
|  | Neighbouring cell |  | Cell 2 | | | | Cell 2 is the candidate cell |
| Final condition | Active cell |  | Cell 2 | | | |  |
| A3-Offset | | dB | -30 | | | |  |
| Hysteresis | | dB | 0 | | | |  |
| Time To Trigger | | s | 0 | | | |  |
| Filter coefficient | |  | 0 | | | | L3 filtering is not used |
| DRX | |  | OFF | | | | DRX is not used |
| Access Barring Information | | - | Not Sent | | | | No additional delays in random access procedure. |
| Time offset between cells | |  | 0.3 μs | | | | RTD between cells is less than CP |
| deriveSSB-IndexFromCell | |  | Enabled | | | |  |
| LTM-CSI-ReportConfig | L1-RSRP reporting period | slot | 320 | | | | Periodic L1-RSRP reporting configured |
| nrOfReportedCells |  | n1 | | | | Report candidate cell’s (Cell 2) L1-RSRP measurement results. |
| nrOfReportedRS-PerCell |  | n1 | | | |
|  | spCellInclusion |  | N/A | | | |
| ltm-DL-OrJointTCI-StateToAddModList | CandidateTCI-State#1 |  | DlorJoint TCI.State.0 | DlorJoint TCI.State.2 | DlorJoint TCI.State.1 | DlorJoint TCI.State.3 | As specified in clause A.3.16B.  In test 1A and 1B, CandidateTCI-State#1 and/or CandidateTCI-UL-State#1 are configured for early TCI state activation.  CandidateTCI-State#2 and/or CandidateTCI-UL-State#1 are configured for TCI state indication in cell switch command.  In test 2A and 2B, CandidateTCI-State#1 and/or CandidateTCI-UL-State#1 are  configured for TCI state indication in cell switch command. |
| CandidateTCI-State#2 |  | DlorJoint TCI.State.1 | DlorJoint TCI.State.3 | N/A | N/A |
| ltm-UL-TCI-StatesToAddModList | CandidateTCI-UL-State#1 |  | N/A | UL TCI.State.0 | N/A | UL TCI.State.0 |
|  |  |  |  |  |  |
| ltm-ConfigComplete | |  | True | | | | Candidate cell’s configuration is complete configuration |
| T1 | | s | <3 | | | |  |
| T2 | | s | ≤0.2 | | | |  |
| T3 | | s | ≤0.1 | | | |  |
| T4 | | s | ≤0.2 | | | |  |

Table A.7.3.x.1.2-3: Cell specific test parameters for NR FR2-FR2 Intra frequency cell switch test case

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Cell 1 | Cell 2 |
|  | | |  | T1 ~ T4 | T1 ~ T4 |
| NR RF Channel Number | | |  | 1 | 1 |
| Assumption for UE beamsNote 6 | | |  | Rough | Rough |
| AoA setup | | |  | Setup 1 as defined in A.3.15 | |
| Duplex mode | | |  | TDD | |
| TDD configuration | | |  | TDDConf.2.1 | |
| BWchannel | | | MHz | 100: NRB,c = 66 | |
| BWP BW | | | MHz | 100: NRB,c = 66 | |
| PDSCH Reference | | |  | SR3.1 TDD | |
| CORESET Reference Channel | | |  | CR3.1 TDD | |
| Control Channel RMC | | |  | CCR.3.1 TDD | |
| CP length | | |  | Normal | |
| TRS configuration | | |  | TRS.2.1 TDD | |
| OCNG Patterns | | |  | OP.1 | |
| SMTC Configuration | | |  | SMTC.1 | |
| SSB Configuration | | |  | SSB.3 FR2 | |
| PDSCH/PDCCH subcarrier spacing | | | kHz | 120 | |
| PUCCH/PUSCH subcarrier spacing | | | kHz | 120 | |
| PRACH configuration | | |  | FR2 PRACH configuration 1 | |
| PDSCH/PDCCH TCI state | | |  | TCI.State.2 | |
| 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) | | |
| Note2 | | | dBm/15kHz | -104.7 | |
| Note2 | | | dBm/SCS | -95.7 | |
|  | | | dB | -1.8 | 0 |
|  | | | dB | 6 | 7 |
| SSB\_RP |  | | dBm/SCS | -89.7 | -88.7 |
| IoNote3 |  | | dBm/  95.04MHz | -56.7 | -56.7 |
| 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  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | |

##### A.7.3.x.1.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 in no later than DLTM from the beginning of time period T4.

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

NOTE: The cell switch delay can be expressed as DLTM (= Tcmd + TLTM-interrupt), where:

Tcmd = THARQ + 3 ms and is specified in clause 6.3.1.2,

TLTM-interrupt = TLTM-RRC-processing + TLTM-processing + Tfirst-RS + TRS-proc + TLTM-IU ms, as stated in section 6.3.1.3

- Tfirst-RS + TRS-proc= 0 ms for Test 1A and 1B, Tfirst-RS + TRS-proc= 22 ms for Test 2A and 2B

- TLTM-IU = 20 ms

- TLTM-RRC-processing = 10 ms if UE does not support [*Early processing of an LTM candidate cell RRC configuration*], otherwise TLTM-RRC-processing =0ms

- TLTM-processing = 10 ms if the UE supports [*faster LTM processing*] capability and UE reports 10 ms for FR2-to-FR2 cell switch in the capability

- TLTM-processing = 15 ms if the UE supports [*faster LTM processing*] capability and UE reports 15 ms for FR2-to-FR2 cell switch in the capability

- TLTM-processing = 20 ms if the UE does not support [*faster LTM processing*] capability.

#### A.7.3.x.2 RACH-less Intra-frequency PCell switch from FR2 to FR2

##### A.7.3.x.2.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR2-NR FR2 RACH-less intra frequency PCell switch specified in clause 6.3.1 for both with and without early TCI state activation.

##### A.7.3.x.2.2 Test Parameters

Two cells are deployed in the test, which are FR2 PCell (Cell 1) and a FR2 neighbour cell (Cell 2) on the same frequency as the PCell. Test configurations are given in table A.7.3.x.2.2-1. Both cell switch delay and interruption length are tested by using the parameters in table A.7.3.x.2.2-2 and A.7.3.x.2.2-3.

The test consists of 4 tests, and UE is required to pass one among Test 1A, Test 1B, Test 2A and Test 2B.

- Test 1: for a UE supporting *ltm-MAC-CE-JointTCI-r18* and/or *ltm-MAC-CE-SeparateTCI-r18*

- Test 1A: for a UE supporting *ltm-MAC-CE-JointTCI-r18*.

- Test 1B: for a UE supporting *ltm-MAC-CE-SeparateTCI-r18* and does not support *ltm-MAC-CE-JointTCI-r18*.

- Test 2: for a UE not supporting *ltm-MAC-CE-JointTCI-r18* and *ltm-MAC-CE-SeparateTCI-r18*

- Test 2A: for a UE supporting *ltm-BeamIndicationJointTCI-r18*.

- Test 2B: for a UE supporting *ltm-BeamIndicationSeparateTCI-r18* and does not support *ltm-BeamIndicationJointTCI-r18*.

The test consists of five successive time periods, with time durations of T1, T2, T3, T4 and T5, respectively. No gap patterns are configured in the test case.

During T1, for Test 1A, 1B, 2A and 2B:

- A measurement object is configured for the frequency of the Cell 2, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

- T1 ends with UE reporting an L3 measurement result of Cell 2 to Cell 1.

During T2, for Test 1A, 1B, 2A and 2B:

- At the start of T2, UE is provided with *LTM-Candidate-r18* for Cell 2

- Joint TCI state configuration as defined in Table A.7.3.x.2.2-2 for Test 1A and Test 2A are provided.

- Separate TCI state configuration as defined in Table A.7.3.x.2.2-2 for Test 1B and Test 2B are provided.

- UE is configured with SSB-based L1-RSRP measurements and periodic L1-RSRP measurement reports on candidate cell (Cell 2) in PUCCH format 2.

- T2 ends with UE reporting a valid L1-RSRP result of Cell 2.

During T3, for Test 1A and 1B:

- At the start of T3, UE receives candidate cell TCI state activation MAC CE for Cell 2.

- In Test 1A, *CandidateTCI-State#1* is activated.

- In Test 1B, *CandidateTCI-State#1* and *CandidateTCI-UL-State#1* is activated.

- T3 ends 50ms after the candidate cell TCI state activation MAC CE transmission.

- In Test 2A and 2B, T3 is skipped.

During T4, for Test 1A, 1B, 2A and 2B:

- At the start of T4, UE receives PDCCH order to trigger PRACH transmission on Cell 2.

- T4 ends 5ms after the UE transmits the PRACH to Cell 2.

- For UE incapable of *rach-EarlyTA-Measurement-r18*, T4 is skipped.

During T5, for Test 1A, 1B, 2A and 2B:

- The start of T5 is the last TTI containing LTM cell switch command MAC CE is sent by Cell 1 to the UE.

- In the cell switch command, Cell 2 is the target cell and the field of Timing Advance Command is set to 0.

- In test 1A, CandidateTCI-State#2 is indicated.

- In test 1B, CandidateTCI-State#2 and CandidateTCI-UL-State#1 are indicated.

- In test 2A, CandidateTCI-State#1 is indicated.

- In test 2B, CandidateTCI-State#1 and CandidateTCI-UL-State#1 are indicated.

- Cell 2 continuously schedules PUSCH for the UE.

- T5 ends either at the UL slot of PUSCH scheduled by Cell 2 at the fist DL slot not earlier than (Tcmd + TLTM-RRC-processing + TLTM-processing + Tfirst-RS + TRS-proc) after the beginning of T5 or upon the reception of PUSCH at Cell 2, whichever is earlier.

- The values of Tcmd, TLTM-RRC-processing TLTM-processing, Tfirst-RS and TRS-proc are specified in A.7.3.x.2.3.

Table A.7.3.x.2.2-1: Intra-frequency cell switch from FR2 to FR2 test configurations

|  |  |
| --- | --- |
| Config | Description |
| 1 | Source cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode  Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Table A.7.3.x.2.2-2: General test parameters for Intra-frequency cell switch from FR2 to FR2

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | | | | Comment |
| Test 1A | Test 1B | Test 2A | Test 2B |
| Initial conditions | Active cell |  | Cell 1 | | | |  |
|  | Neighbouring cell |  | Cell 2 | | | | Cell 2 is the candidate cell |
| Final condition | Active cell |  | Cell 2 | | | |  |
| A3-Offset | | dB | -30 | | | |  |
| Hysteresis | | dB | 0 | | | |  |
| Time To Trigger | | s | 0 | | | |  |
| Filter coefficient | |  | 0 | | | | L3 filtering is not used |
| DRX | |  | OFF | | | | DRX is not used |
| Access Barring Information | | - | Not Sent | | | | No additional delays in random access procedure. |
| Time offset between cells | |  | 0.3 μs | | | | RTD between cells is less than CP |
| deriveSSB-IndexFromCell | |  | Enabled | | | |  |
| LTM-CSI-ReportConfig | L1-RSRP reporting period | slot | 320 | | | | Periodic L1-RSRP reporting configured |
| nrOfReportedCells |  | n1 | | | | Report candidate cell’s (Cell 2) L1-RSRP measurement results. |
| nrOfReportedRS-PerCell |  | n1 | | | |
|  | spCellInclusion |  | N/A | | | |
| EarlyUL-SyncConfig | frequencyInfoUL |  | NR RF Channel Number 1 | | | | Same as Cell 1 |
| PRACH configuration |  | FR2 PRACH configuration 5 | | | | RACH bandwidth is within active UL BWP of Cell 1 |
| bwp-GenericParameters |  | ULBWP.0.1 | | | |
| n-TimingAdvanceOffset | Tc | N/A | | | |
| ltm-DL-OrJointTCI-StateToAddModList | CandidateTCI-State#1 |  | DlorJoint TCI.State.0 | DlorJoint TCI.State.2 | DlorJoint TCI.State.1 | DlorJoint TCI.State.3 | As specified in clause A.3.16B.  In test 1A and 1B, CandidateTCI-State#1 and/or CandidateTCI-UL-State#1 are configured for early TCI state activation.  CandidateTCI-State#2 and/or CandidateTCI-UL-State#1 are configured for TCI state indication in cell switch command.  In test 2A and 2B, CandidateTCI-State#1 and/or CandidateTCI-UL-State#1 are  configured for TCI state indication in cell switch command. |
| CandidateTCI-State#2 |  | DlorJoint TCI.State.1 | DlorJoint TCI.State.3 | N/A | N/A |
| ltm-UL-TCI-StatesToAddModList | CandidateTCI-UL-State#1 |  | N/A | UL TCI.State.0 | N/A | UL TCI.State.0 |
|  |  |  |  |  |  |
| ltm-ConfigComplete | |  | True | | | | Candidate cell’s configuration is complete configuration |
| T1 | | s | <3 | | | |  |
| T2 | | s | ≤0.2 | | | |  |
| T3 | | s | ≤0.1 | | | |  |
| T4 | | s | ≤0.2 | | | |  |
| T5 | | s | ≤0.1 | | | |  |

Table A.7.3.x.2.2-3: Cell specific test parameters for NR FR2-FR2 Intra frequency cell switch test case

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Cell 1 | Cell 2 |
|  | | |  | T1 ~ T5 | T1 ~ T5 |
| NR RF Channel Number | | |  | 1 | 1 |
| Assumption for UE beamsNote 6 | | |  | Rough | Rough |
| AoA setup | | |  | Setup 1 as defined in A.3.15 | |
| Duplex mode | | |  | TDD | |
| TDD configuration | | |  | TDDConf.2.1 | |
| BWchannel | | | MHz | 100: NRB,c = 66 | |
| BWP BW | | | MHz | 100: NRB,c = 66 | |
| PDSCH Reference | | |  | SR3.1 TDD | |
| CORESET Reference Channel | | |  | CR3.1 TDD | |
| Control Channel RMC | | |  | CCR.3.1 TDD | |
| CP length | | |  | Normal | |
| TRS configuration | | |  | TRS.2.1 TDD | |
| OCNG Patterns | | |  | OP.1 | |
| SMTC Configuration | | |  | SMTC.1 | |
| SSB Configuration | | |  | SSB.3 FR2 | |
| PDSCH/PDCCH subcarrier spacing | | | kHz | 120 | |
| PUCCH/PUSCH subcarrier spacing | | | kHz | 120 | |
| PRACH configuration | | |  | FR2 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) | | |
| Note2 | | | dBm/15kHz | -104.7 | |
| Note2 | | | dBm/SCS | -95.7 | |
|  | | | dB | -1.8 | 0 |
|  | | | dB | 6 | 7 |
| SSB\_RP |  | | dBm/SCS | -88.7 | -89.7 |
| IoNote3 |  | | dBm/  95.04MHz | -56.7 | -56.7 |
| 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  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | |

##### A.7.3.x.2.3 Test Requirements

The UE shall start to transmit PUSCH to Cell 2 in no later than DLTM from the beginning of time period T5.

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

NOTE: The cell switch delay can be expressed as DLTM (= Tcmd + TLTM-interrupt), where:

Tcmd = THARQ + 3 ms and is specified in clause 6.3.1.2, TLTM-interrupt is defined in clause 6.3.1.3 as TLTM-RRC-processing + TLTM-processing + Tfirst-RS + TRS-proc + TLTM-IU,

- Tfirst-RS + TRS-proc= 0 ms for Test 1A and 1B, Tfirst-RS + TRS-proc= 22 ms for Test 2A and 2B,

- TLTM-IU is the uncertainty on transmitting the first uplink transmission on Cell 2.

- TLTM-RRC-processing = 10 ms if UE does not support [*Early processing of an LTM candidate cell RRC configuration*], otherwise TLTM-RRC-processing =0ms

- TLTM-processing = 10 ms if the UE supports [*faster LTM processing*] capability and UE reports 10 ms for FR2-to-FR2 cell switch in the capability

- TLTM-processing = 15 ms if the UE supports [*faster LTM processing*] capability and UE reports 15 ms for FR2-to-FR2 cell switch in the capability

- TLTM-processing = 20 ms if the UE does not support [*faster LTM processing*] capability.

#### A.7.3.x.3 RACH-based Inter-frequency LTM PCell switch from FR2 to FR2

##### A.7.3.x.3.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR2-NR FR2 RACH-based inter-frequency PCell switch specified in clause 6.3.1 for both with and without early TCI state activation.

##### A.7.3.x.3.2 Test Parameters

Two cells are deployed in the test, which are FR2 PCell (Cell 1) and a FR2 neighbour cell (Cell 2) on a different frequency than the PCell. Test configurations are given in table A.7.3.x.3.2-1. Both cell switch delay and interruption length are tested by using the parameters in table A.7.3.x.3.2-2 and A.7.3.x.3.2-3.

The test consists of 4 tests, and UE is required to pass one among Test 1A, Test 1B, Test 2A and Test 2B.

- Test 1: for a UE supporting *ltm-MAC-CE-JointTCI-r18* and/or *ltm-MAC-CE-SeparateTCI-r18*

- Test 1A: for a UE supporting *ltm-MAC-CE-JointTCI-r18*.

- Test 1B: for a UE supporting *ltm-MAC-CE-SeparateTCI-r18* and does not support *ltm-MAC-CE-JointTCI-r18*.

- Test 2: for a UE not supporting *ltm-MAC-CE-JointTCI-r18* and *ltm-MAC-CE-SeparateTCI-r18*

- Test 2A: for a UE supporting *ltm-BeamIndicationJointTCI-r18*.

- Test 2B: for a UE supporting *ltm-BeamIndicationSeparateTCI-r18* and does not support *ltm-BeamIndicationJointTCI-r18*.

The test consists of five successive time periods, with time durations of T1, T2, T3, and T4, respectively. Measurement gap pattern gp0 is configured.

During T1, for Test 1A, 1B,2A and 2B:

- A measurement object is configured for the frequency of the Cell 2, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

- T1 ends with UE reporting an L3 measurement result of Cell 2 to Cell 1.

During T2, for Test 1A, 1B, 2A and 2B:

- At the start of T2, UE is provided with *LTM-Candidate-r18* for Cell 2

- Joint TCI state configuration as defined in Table A.7.3.x.3.2-2 for Test 1A and Test 2A are provided.

- Separate TCI state configuration as defined in Table A.7.3.x.3.2-2 for Test 1B and Test 2B are provided.

- UE is configured with SSB-based L1-RSRP measurements and periodic L1-RSRP measurement reports on candidate cell (Cell 2) in PUCCH format 2.

- T2 ends with UE reporting a valid L1-RSRP result of Cell 2.

During T3, for Test 1A and 1B:

- At the start of T3, UE receives candidate cell TCI state activation MAC CE for Cell 2.

- In Test 1A, *CandidateTCI-State#1* is activated.

- In Test 1B, *CandidateTCI-State#1* and *CandidateTCI-UL-State#1* is activated.

- T3 ends 100 ms after the candidate cell TCI state activation MAC CE transmission.

- In Test 2A and 2B, T3 is skipped.

During T4, for Test 1A, 1B, 2A and 2B:

- The start of T4 is the last TTI containing LTM cell switch command MAC CE is sent by Cell 1 to the UE.

- In the cell switch command, Cell 2 is the target cell and the field of Timing Advance Command is set to 0.

- In test 1A, CandidateTCI-State#2 is indicated.

- In test 1B, CandidateTCI-State#2 and CandidateTCI-UL-State#1 are indicated.

- In test 2A, CandidateTCI-State#1 is indicated.

- In test 2B, CandidateTCI-State#1 and CandidateTCI-UL-State#1 are indicated.

- Cell 2 continuously schedules PUSCH for the UE.

- T4 ends upon the reception of PRACH at Cell 2.

Table A.7.3.x.3.2-1: Inter-frequency cell switch from FR2 to FR2 test configurations

|  |  |
| --- | --- |
| Config | Description |
| 1 | Source cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode  Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Table A.7.3.x.3.2-2: General test parameters for Inter-frequency cell switch from FR2 to FR2

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | | | | Comment |
| Test 1A | Test 1B | Test 2A | Test 2B |
| Initial conditions | Active cell |  | Cell 1 | | | |  |
|  | Neighbouring cell |  | Cell 2 | | | | Cell 2 is the candidate cell |
| Final condition | Active cell |  | Cell 2 | | | |  |
| A3-Offset | | dB | -30 | | | |  |
| Hysteresis | | dB | 0 | | | |  |
| Time To Trigger | | s | 0 | | | |  |
| Filter coefficient | |  | 0 | | | | L3 filtering is not used |
| includeBeamMeasurements | |  | True | | | |  |
| DRX | |  | OFF | | | | DRX is not used |
| Measurement gap pattern ID | |  | gp0 | | | | As specified in Table 9.1.2-1 |
| Measurement gap offset | |  | 39 | | | |  |
| Access Barring Information | | - | Not Sent | | | | No additional delays in random access procedure. |
| Time offset between cells | |  | 0.3 μs | | | |  |
| deriveSSB-IndexFromCell | |  | Enabled | | | |  |
| LTM-CSI-ReportConfig | L1-RSRP reporting period | slot | 320 | | | | Periodic L1-RSRP reporting configured |
| nrOfReportedCells |  | n1 | | | | Report candidate cell’s (Cell 2) L1-RSRP measurement results. |
| nrOfReportedRS-PerCell |  | n1 | | | |
|  | spCellInclusion |  | N/A | | | |
| ltm-DL-OrJointTCI-StateToAddModList | CandidateTCI-State#1 |  | DlorJoint TCI.State.0 | DlorJoint TCI.State.2 | DlorJoint TCI.State.1 | DlorJoint TCI.State.3 | As specified in clause A.3.16B.  In test 1A and 1B, CandidateTCI-State#1 and/or CandidateTCI-UL-State#1 are configured for early TCI state activation.  CandidateTCI-State#2 and/or CandidateTCI-UL-State#1 are configured for TCI state indication in cell switch command.  In test 2A and 2B, CandidateTCI-State#1 and/or CandidateTCI-UL-State#1 are  configured for TCI state indication in cell switch command. |
| CandidateTCI-State#2 |  | DlorJoint TCI.State.1 | DlorJoint TCI.State.3 | N/A | N/A |
| ltm-UL-TCI-StatesToAddModList | CandidateTCI-UL-State#1 |  | N/A | UL TCI.State.0 | N/A | UL TCI.State.0 |
|  |  |  |  |  |  |
| ltm-ConfigComplete | |  | True | | | | Candidate cell’s configuration is complete configuration |
| T1 | | s | <3 | | | |  |
| T2 | | s | ≤0.2 | | | |  |
| T3 | | s | ≤0.2 | | | |  |
| T4 | | s | ≤0.1 | | | |  |

Table A.7.3.x.3.2-3: Cell specific test parameters for NR FR2-FR2 Inter frequency cell switch test case

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Cell 1 | Cell 2 |
|  | | |  | T1 ~ T5 | T1 ~ T5 |
| NR RF Channel Number | | |  | 1 | 2 |
| Assumption for UE beamsNote 6 | | |  | Rough | Rough |
| AoA setup | | |  | Setup 1 as defined in A.3.15 | |
| Duplex mode | | |  | TDD | |
| TDD configuration | | |  | TDDConf.2.1 | |
| BWchannel | | | MHz | 100: NRB,c = 66 | |
| BWP BW | | | MHz | 100: NRB,c = 66 | |
| PDSCH Reference | | |  | SR3.1 TDD | |
| CORESET Reference Channel | | |  | CR3.1 TDD | |
| Control Channel RMC | | |  | CCR.3.1 TDD | |
| CP length | | |  | Normal | |
| TRS configuration | | |  | TRS.2.1 TDD | |
| OCNG Patterns | | |  | OP.1 | |
| SMTC Configuration | | |  | SMTC.1 | |
| SSB Configuration | | |  | SSB.3 FR2 | |
| PDSCH/PDCCH subcarrier spacing | | | kHz | 120 | |
| PUCCH/PUSCH subcarrier spacing | | | kHz | 120 | |
| PRACH configuration | | |  | FR2 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) | | |
| Note2 | | | dBm/15kHz | -104.7 | |
| Note2 | | | dBm/SCS | -95.7 | |
|  |  | |
|  | | | dB | 5 | 5 |
|  | | | dB | 5 | 5 |
| SSB\_RP |  | | dBm/SCS | -90.7 | -90.7 |
| IoNote3 |  | | dBm/  95.04MHz | -60.5 | -60.5 |
| 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  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | |

##### A.7.3.x.3.3 Test Requirements

The UE shall start to transmit PUSCH to Cell 2 in no later than DLTM from the beginning of time period T4.

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

NOTE: The cell switch delay can be expressed as DLTM (= Tcmd + TLTM-interrupt), where:

Tcmd = THARQ + 3 ms and is specified in clause 6.3.1.2, TLTM-interrupt is defined in clause 6.3.1.3 as TLTM-RRC-processing + TLTM-processing + Tfirst-RS + TRS-proc + TLTM-IU,

- Tfirst-RS + TRS-proc= 0 ms for Test 1A and 1B, Tfirst-RS + TRS-proc= 22 ms for Test 2A and 2B,

- TLTM-IU = 20 ms.

- TLTM-RRC-processing = 10 ms if UE does not support [*Early processing of an LTM candidate cell RRC configuration*], otherwise TLTM-RRC-processing =0ms

- TLTM-processing = 10 ms if the UE supports [*faster LTM processing*] capability and UE reports 10 ms for FR2-to-FR2 cell switch in the capability

- TLTM-processing = 15 ms if the UE supports [*faster LTM processing*] capability and UE reports 15 ms for FR2-to-FR2 cell switch in the capability

- TLTM-processing = 20 ms if the UE does not support [*faster LTM processing*] capability.

End of Change 17

Start of Change 18

### A.7.3.x1 LTM PSCell Switch

#### A.7.3.x1.1 RACH-based Intra-frequency LTM PSCell switch from FR2 to FR2

##### A.7.3.x1.1.1 Test Purpose and Environment

This test is to verify RACH-based LTM PSCell Switch requirements for the NR FR2-NR FR2 intra frequency cell switch specified in clause 8.20 for both with and without early TCI state activation.

##### A.7.3.x1.1.2 Test Parameters

Three cells are deployed in the test, which are FR1 PCell (Cell 1), source FR2 PSCell (Cell 2) and target FR2 PSCell (Cell 3) on the same frequency as the PSCell. Test configurations are given in table A.7.3.x1.1.2-1. Both PSCell cell switch delay and interruption length are tested by using the parameters in table A.7.3.x1.1.2-2, A.7.3.x1.1.2-3 and A.7.3.x1.1.2-4.

The test consists of 4 tests, and UE is required to pass one among Test 1A, Test 1B, Test 2A and Test 2B.

- Test 1: for a UE supporting *ltm-MAC-CE-JointTCI-r18* and/or *ltm-MAC-CE-SeparateTCI-r18*

- Test 1A: for a UE supporting *ltm-MAC-CE-JointTCI-r18*.

- Test 1B: for a UE supporting *ltm-MAC-CE-SeparateTCI-r18* and does not support *ltm-MAC-CE-JointTCI-r18*.

- Test 2: for a UE not supporting *ltm-MAC-CE-JointTCI-r18* and *ltm-MAC-CE-SeparateTCI-r18*

- Test 2A: for a UE supporting *ltm-BeamIndicationJointTCI-r18*.

- Test 2B: for a UE supporting *ltm-BeamIndicationSeparateTCI-r18* and does not support *ltm-BeamIndicationJointTCI-r18*.

The test consists of four successive time periods, with time durations of T1, T2, T3 and T4, respectively. No gap patterns are configured in the test case.

During T1, for Test 1A, 1B, 2A and 2B:

- A measurement object is configured for the frequency of the Cell 3, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

- T1 ends with UE reporting an L3 measurement result of Cell 3 to Cell 1.

During T2, for Test 1A, 1B, 2A and 2B:

- At the start of T2, UE is provided with *LTM-Candidate-r18* for Cell 3

- Joint TCI state configuration as defined in Table A.7.3.x1.1.2-2 for Test 1A and Test 2A are provided.

- Separate TCI state configuration as defined in Table A.7.3.x1.1.2-2 for Test 1B and Test 2B are provided.

- UE is configured with SSB-based L1-RSRP measurements and periodic L1-RSRP measurement reports on candidate cell (Cell 3) in PUCCH format 2.

- T2 ends with UE reporting a valid L1-RSRP result of Cell 3.

During T3, for Test 1A and 1B:

- At the start of T3, UE receives candidate cell TCI state activation MAC CE for Cell 3.

- In Test 1A, *CandidateTCI-State#1* is activated.

- In Test 1B, *CandidateTCI-State#1* and *CandidateTCI-UL-State#1* is activated.

- T3 ends 50 ms after the candidate cell TCI state activation MAC CE transmission.

- In Test 2A and 2B, T3 is skipped.

During T4, for Test 1A, 1B, 2A and 2B:

- The start of T4 is the instant when the last TTI containing LTM cell switch command MAC CE is sent by Cell 2 to the UE.

- In the cell switch command, Cell 3 is the target cell for PSCell switch. Contention-Free Random-Access Resources are indicated and the field of Timing Advance Command is set to FFF.

- In test 1A, CandidateTCI-State#2 is indicated.

- In test 1B, CandidateTCI-State#2 and CandidateTCI-UL-State#1 are indicated.

- In test 2A, CandidateTCI-State#1 is indicated.

- In test 2B, CandidateTCI-State#1 and CandidateTCI-UL-State#1 are indicated.

- T4 ends upon the reception of PRACH at Cell 3.

Table A.7.3.x1.1.2-1: Intra-frequency PSCell switch from FR2 to FR2 test configurations

|  |  |
| --- | --- |
| Config | Description |
| 1 | Pcell: FR1 NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode  Source Pscell: FR2 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode  Target Pscell: FR2 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | Pcell: FR1 NR 15kHz SSB SCS, 10MHz bandwidth, TDD duplex mode  Source Pscell: FR2 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode  Target Pscell: FR2 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 3 | Pcell: FR1 NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode  Source Pscell: FR2 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode  Target Pscell: FR2 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations  Note 2: Target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

Table A.7.3.x1.1.2-2: General test parameters for Intra-frequency cell switch from FR2 to FR2

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | | | | Comment |
| Test 1A | Test 1B | Test 2A | Test 2B |
| Initial conditions | Active cell |  | Cell 1, Cell 2 | | | |  |
|  | Neighbouring cell |  | Cell 3 | | | | Cell 3 is the candidate cell |
| Final condition | Active cell |  | Cell 1, Cell 3 | | | |  |
| A3-Offset | | dB | -30 | | | |  |
| Hysteresis | | dB | 0 | | | |  |
| Time To Trigger | | s | 0 | | | |  |
| Filter coefficient | |  | 0 | | | | L3 filtering is not used |
| DRX | |  | OFF | | | | DRX is not used |
| Access Barring Information | | - | Not Sent | | | | No additional delays in random access procedure. |
| Time offset between Cell 2 and Cell 3 | |  | 0.3 μs | | | | RTD between Cell 2 and Cell 3 is less than CP |
| deriveSSB-IndexFromCell | |  | Enabled | | | |  |
| LTM-CSI-ReportConfig | L1-RSRP reporting period | slot | 320 | | | | Periodic L1-RSRP reporting configured |
| nrOfReportedCells |  | n1 | | | | Report candidate cell’s (Cell 3) L1-RSRP measurement results. |
| nrOfReportedRS-PerCell |  | n1 | | | |
|  | spCellInclusion |  | N/A | | | |
| ltm-DL-OrJointTCI-StateToAddModList | CandidateTCI-State#1 |  | DlorJoint TCI.State.0 | DLorJoint TCI.State.2 | DLorJoint TCI.State.1 | DLorJoint TCI.State.3 | As specified in clause A.3.16B.  In test 1A and 1B, CandidateTCI-State#1 and/or CandidateTCI-UL-State#1 are configured for early TCI state activation.  CandidateTCI-State#2 and/or CandidateTCI-UL-State#1 are configured for TCI state indication in cell switch command.  In test 2A and 2B, CandidateTCI-State#1 and/or CandidateTCI-UL-State#1 are  configured for TCI state indication in cell switch command. |
| CandidateTCI-State#2 |  | DLorJoint TCI.State.1 | DLorJoint TCI.State.3 | N/A | N/A |
| ltm-UL-TCI-StatesToAddModList | CandidateTCI-UL-State#1 |  | N/A | UL TCI.State.0 | N/A | UL TCI.State.0 |
|  |  |  |  |  |  |
| ltm-ConfigComplete | |  | True | | | | Candidate cell’s configuration is complete configuration |
| T1 | | s | <3 | | | |  |
| T2 | | s | ≤0.2 | | | |  |
| T3 | | s | ≤0.1 | | | |  |
| T4 | | s | ≤0.1 | | | |  |

Table A.7.3.Y.1.2-3: Cell specific test parameters for PCell (Cell 1)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | | Unit | Cell 1 |
|  | | |  | T1~T4 |
| 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 |
| BWchannel | | Config 1 | MHz | 10: NRB,c = 52 |
| Config 2 | 10: NRB,c = 52 |
| Config 3 | 40: NRB,c = 106 |
| BWP BW | | Config 1 | MHz | 10: NRB,c = 52 |
| Config 2 | 10: NRB,c = 52 |
| Config 3 | 40: NRB,c = 106 |
| TRS configuration | | Config 1 |  | TRS.1.1 FDD |
| Config 2 |  | TRS.1.1 TDD |
| Config 3 |  | TRS.1.2 TDD |
| DRx Cycle | | | ms | Not Applicable |
| PDSCH Reference measurement channel | | Config 1 |  | SR.1.1 FDD |
| Config 2 |  | SR.1.1 TDD |
| Config 3 |  | SR.2.1 TDD |
| CORESET Reference Channel | | Config 1 |  | CR.1.1 FDD |
| Config 2 |  | CR.1.1 TDD |
| Config 3 |  | CR.2.1 TDD |
| OCNG Patterns | | |  | OP.1 |
| 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 | | 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) | | |  |  |
| Note2 | | | dBm/15kHz | -98 |
| Note2 | Config 1,2 | | dBm/SCS | -98 |
| Config 3 | |  |
|  | | | dB | 4 |
|  | | | dB | 4 |
| SSB\_RP | Config 1,2 | | dBm/SCS | -94 |
| Config 3 | | -91 |
| IoNote3 | Config 1,2 | | dBm/  9.36MHz | -64.59 |
| Config 3 | | dBm/  38.16MHz | -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  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

Table A.7.3.x.1.2-4: Cell specific test parameters for NR FR2-FR2 Intra frequency cell switch test case

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Cell 2 | Cell 3 |
|  | | |  | T1 ~ T4 | T1 ~ T4 |
| NR RF Channel Number | | |  | 2 | 2 |
| Assumption for UE beamsNote 6 | | |  | Rough | Rough |
| AoA setup | | |  | Setup 1 as defined in A.3.15 | |
| Duplex mode | | |  | TDD | |
| TDD configuration | | |  | TDDConf.2.1 | |
| BWchannel | | | MHz | 100: NRB,c = 66 | |
| BWP BW | | | MHz | 100: NRB,c = 66 | |
| PDSCH Reference | | |  | SR3.1 TDD | |
| CORESET Reference Channel | | |  | CR3.1 TDD | |
| Control Channel RMC | | |  | CCR.3.1 TDD | |
| CP length | | |  | Normal | |
| TRS configuration | | |  | TRS.2.1 TDD | |
| OCNG Patterns | | |  | OP.1 | |
| SMTC Configuration | | |  | SMTC.1 | |
| SSB Configuration | | |  | SSB.3 FR2 | |
| PDSCH/PDCCH subcarrier spacing | | | kHz | 120 | |
| PUCCH/PUSCH subcarrier spacing | | | kHz | 120 | |
| PRACH configuration | | |  | FR2 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) | | |
| Note2 | | | dBm/15kHz | -104.7 | |
| Note2 | | | dBm/SCS | -95.7 | |
|  | | | dB | -1.8 | 0 |
|  | | | dB | 6 | 7 |
| SSB\_RP |  | | dBm/SCS | -88.7 | -89.7 |
| IoNote3 |  | | dBm/  95.04MHz | -56.7 | -56.7 |
| 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  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | |

##### A.7.3.x.1.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 3 in no later than DLTM from the beginning of time period T4.

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

NOTE: The cell switch delay can be expressed as DLTM (= Tcmd + TLTM-interrupt), where:

Tcmd = THARQ + 3 ms and is specified in clause 6.3.1.2, TLTM-interrupt is defined in clause 8.20.3 as TLTM-interrupt = TLTM-RRC-processing + TLTM-processing + Tfirst-RS + TRS-proc + TLTM-IU ms.

- Tfirst-RS + TRS-proc= 0 ms for Test 1A and 1B, Tfirst-RS + TRS-proc= 22 ms for Test 2A and 2B

- TLTM-IU=20ms,

- TLTM-RRC-processing = 10 ms if UE does not support [*Early processing of an LTM candidate cell RRC configuration*], otherwise TLTM-RRC-processing =0ms

- TLTM-processing = 10 ms if the UE supports [*faster LTM processing*] capability and UE reports 10 ms for FR2-to-FR2 cell switch in the capability

- TLTM-processing = 15 ms if the UE supports [*faster LTM processing*] capability and UE reports 15 ms for FR2-to-FR2 cell switch in the capability

- TLTM-processing = 20 ms if the UE does not support [*faster LTM processing*] capability.

End of Change 18

Start of Change 19

### A.7.6.x LTM Intra-frequency L1-RSRP measurement

#### A.7.6.X.1 Intra-frequency SSB based L1-RSRP measurement in FR2

##### A.7.6.X.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of SSB based intra-frequency L1-RSRP measurement on neighbor cell in FR2. This test will partly verify the L1-RSRP measurement requirements in clause 9.14, with the testing configurations for NR cells in Table A.7.6.X.1.1-1.

The AoA setup of FR2 cell for this test is Setup 3 as defined in clause A.3.15.

Table A.7.6.X.1.1-1: Applicable NR configurations for SSB based Intra-frequency L1-RSRP LTM measurement with activated TCI state test in FR2

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

##### A.7.6.X.1.2 Test parameters

There are two cells in the test, which are FR2 PCell (Cell 1) and a FR2 neighbour cell (Cell 2) on the same frequency as the PCell.

Measurement period [and measurement accuracy] is tested by using the parameters in Table A.7.6.X.1.2-1 and Table A.7.6.X.1.2-2.

There are two tests in the test case, test 1 and test 2:

* In test 1, time offset between cells is within CP length.
* In test 2, time offset between cells is larger than CP length.

If a UE does not support *[RTD>CP]*, it is only required to pass test 1. Otherwise, it is only required to pass test 2.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the SSBs, and report measurement results periodically. The test consists of two successive time periods, with time duration of T1 and T2 respectively. SSB\_RP of Cell 2 in T1 and T2 are different. No gap patterns are configured in the test case.

Prior to the start of the time duration T1,

- UE is connected to Cell 1 (PCell) on RF channel 1 (PCC).

- A measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. Before the start of the T1, event is triggered, and UE has sent a measurement report for the Cell 2 with SSB Index.

- UE is provided with *LTM-Candidate-r18* for Cell 2*.*

- UE is configured with SSB-based L1-RSRP measurements and periodic L1-RSRP measurement reports on candidate cell (Cell 2) in PUCCH format 2.

- The UE has performed L3 measurement on Cell 2.

At the beginning of T2, SSB\_RP of Cell 2 change to different values from T1. T2 starts at the beginning of a frame with an odd SFN.

Table A.7.6.X.1.2-1: General test parameters for SSB based intra-frequency L1-RSRP LTM measurement without activated TCI state test in FR2

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | | Comment |
| Test 1 | Test 2 |
| Active cell | |  | Cell 1 | |  |
| Neighbouring cell | |  | Cell 2 | | Cell 2 is the candidate cell |
| A3-Offset | | dB | -30 | |  |
| Hysteresis | | dB | 0 | |  |
| Time To Trigger | | ms | 0 | |  |
| Filter coefficient | |  | 0 | | L3 filtering is not used |
| DRX | |  | OFF | | DRX is not used |
| Time offset between cells | |  | 0.2 μs | 2μs | The timing of Cell 2 is later than the timing of Cell 1 |
| deriveSSB-IndexFromCell | |  | Enabled | |  |
| LTM-CSI-ReportConfig | L1-RSRP reporting period | slot | 320 | | Periodic L1-RSRP reporting configured |
| nrOfReportedCells |  | n1 | | Report candidate cell’s (Cell 2) L1-RSRP measurement results. |
| nrOfReportedRS-PerCell |  | n1 | |
|  | spCellInclusion |  | N/A | |
| ltm-ConfigComplete | |  | True | | Candidate cell’s configuration is complete configuration |
| T1 | | s | 1.5 | |  |
| T2 | | s | ≤ 2 | |  |

Table A.7.6.X.1.2-2: Cell specific test parameters for SSB based intra-frequency L1-RSRP LTM measurement without activated TCI state test in FR2

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Config** | **Unit** | **Cell 1** | | **Cell 2** | |
| **T1** | **T2** | **T1** | **T2** |
| SSB GSCN | 1~2 |  | Freq1 | | | |
| Duplex mode | 1~2 |  | TDD | | | |
| TDD Configuration | 1~2 |  | TDDConf.3.1 | | | |
| BWchannel | 1~2 | MHz | 100: NRB,c = 66 | | | |
| Data RBs allocated | 1~2 |  | 66 | | | |
| PDSCH/PDCCH subcarrier spacing | 1~2 | KHz | 120 | | | |
| PUCCH/PUSCH subcarrier spacing | 1~2 | KHz | 120 | | | |
| PDSCH Reference measurement channel | 1 |  | SR.3.2 TDD | | N/A | |
| 2 | SR.3.3 TDD | | N/A | |
| RMSI CORESET Reference Channel | 1, |  | CR.3.1 TDD | | N/A | |
| 2 | CR.3.2 TDD | | N/A | |
| Dedicated CORESET Reference Channel | 1 |  | CCR.3.1 TDD | | N/A | |
| 2 | CCR.3.7 TDD | | N/A | |
| SSB configuration | 1 |  | SSB.3 FR2 | | SSB.7 FR2 | |
|  | 2 | SSB.8 FR2 | | SSB.4 FR2 | |
| OCNG Patterns | 1~2 |  | OP.4 | | N/A | |
| Initial BWP Configuration | 1~2 |  | DLBWP.0.1  ULBWP.0.1 | | | |
| Dedicated BWP configuration | 1~2 |  | DLBWP.1.3  ULBWP.1.3 | | | |
| SMTC configuration | 1~2 |  | SMTC.1 | | | |
| TRS Configuration | 1~2 |  | TRS.2.1 TDD | | N/A | |
| PDCCH/PDSCH TCI Configuration | 1~2 |  | TCI.State.2 | | N/A | |
| EPRE ratio of PSS to SSS | 1~2 | dB | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS |  |  |  | |  | |
| EPRE ratio of PBCH to PBCH DMRS |  |  |  | |  | |
| EPRE ratio of PDCCH DMRS to SSS |  |  |  | |  | |
| EPRE ratio of PDCCH to PDCCH DMRS |  |  |  | |  | |
| EPRE ratio of PDSCH DMRS to SSS |  |  |  | |  | |
| EPRE ratio of PDSCH to PDSCH DMRS |  |  |  | |  | |
| EPRE ratio of OCNG DMRS to SSSNote 1 |  |  |  | |  | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |  |  |  | |  | |
| Propagation condition | 1~2 |  | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | | |

Table A.7.6.X.1.2-3: NR OTA Cell specific test parameters for SSB based intra-frequency L1-RSRP LTM measurement without activated TCI state test in FR2

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Config** | **Unit** | **Cell 1** | | **Cell 2** | |
|  |  |  | **T1** | **T2** | **T1** | **T2** |
| Angle of arrival configuration | 1~2 |  | Setup 1 according to A.3.15.1 | | | |
|  | |  | |
| Beam AssumptionNote 4 | 1~2 |  | Rough | | Rough | |
| BBNote 5 | 1~2 | dB | -1.5 | 16.5 | -1.5 | 16.5 |
| SSB\_RP Note3 | 1 | dBm/SSB SCS | -103 | -85 | -103 | -85 |
|  | 2 |  | -100 | -82 | -100 | -82 |
| Io Note3 | 1 | dBm/95.04MHz | -74 | -56 | -74 | -56 |
|  | 2 |  | -74 | -56 | -74 | -56 |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 5: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | | |

##### A.7.6.X.1.3 Test Requirements

The UE shall send L1-RSRP report every 320 slots in T2. The UE shall start to report a larger L1-RSRP value of Cell 2 in no later than 960 ms plus 320 slots from the beginning of time period T2, UE shall send L1-RSRP report including the valid results for Cell 2 while meeting the accuracy requirements defined in clause 10.1.20X.The reported L1-RSRP value shall include the Rx antenna gain in the range of -10 to +20 dB.

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

End of Change 19

Start of Change 20

### A.7.6.Y LTM Inter-frequency L1-RSRP measurement with measurement gap

#### A.7.6.Y.1 Inter-frequency SSB-based L1-RSRP measurement with measurement gap for LTM

##### A.7.6.Y.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of inter-frequency L1-RSRP measurement with MG for LTM. This test will partly verify the L1-RSRP measurement requirements in clause 9.15.5, with the testing configurations in Tables A.7.6.Y.1.1-1, A.7.6.Y.1.2-1, A.7.6.Y.1.2-2 and A.7.6.Y.1.2-3.

The AoA setup of FR2 cell for this test is Setup 1 as defined in clause A.3.15.

Table A.7.6.Y.1.1-1: Applicable NR configurations for inter-cell L1-RSRP measurement with measurement gapfor LTM

|  |  |
| --- | --- |
| Config | Description |
| 1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations  Note 2: Target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

##### A.7.6.Y.1.2 Test parameters

There are two cells in the test, Cell 1 is the PCell on NR RF channel number 1 and Cell 2 is a neighbor cell NR RF channel number 2. The test parameters for Cell 1 and Cell 2 are given in Table A.7.6.Y.1.2-2 and Table A.7.6.Y.1.2-3.

The test consists of two successive time periods, with time duration of T1 and T2 respectively. SSB\_RP of Cell 2 in T1 and T2 are different. Measurement gap is configured in the test.

Prior to the start of the time duration T1,

- UE is connected to Cell 1 (PCell) on RF channel 1 (PCC).

- A measurement object is configured for the RF channel 2, and it is indicated to the UE that event-triggered reporting with Event A3 is used. Before the start of the T1, event is triggered, and UE has sent a measurement report for the Cell 2 with SSB Index.

- UE is provided with *LTM-Candidate-r18* for Cell 2*.*

- UE is configured with SSB-based L1-RSRP measurements and periodic L1-RSRP measurement reports on candidate cell (Cell 2) in PUCCH format 2.

At the beginning of T2, SSB\_RP of Cell 2 changes to a different value from T1.

Table A.7.6.y.1.2-1: General test parameters for SSB based inter-frequency L1-RSRP LTM measurement with measurement gap test in FR2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Active cell | |  | Cell 1 |  |
| Neighbouring cell | |  | Cell 2 | Cell 2 is the candidate cell |
| A3-Offset | | dB | -30 |  |
| Hysteresis | | dB | 0 |  |
| Time To Trigger | | ms | 0 |  |
| Filter coefficient | |  | 0 | L3 filtering is not used |
| maxNrofRS-IndexesToReport | |  | 1 |  |
| includeBeamMeasurements | |  | True |  |
| DRX | |  | OFF | DRX is not used |
| Time offset between cells | |  | 3 μs | The timing of Cell 2 is later than the timing of Cell 1 |
| deriveSSB-IndexFromCell | |  | Enabled | Not relevant to this test case |
| Gap Pattern Id | |  | 13 |  |
| Measurement gap offset | | ms | 39 |  |
| LTM-CSI-ReportConfig | L1-RSRP reporting period | slot | 320 | Periodic L1-RSRP reporting configured |
| nrOfReportedCells |  | n1 | Report candidate cell’s (Cell 2) L1-RSRP measurement results. |
| nrOfReportedRS-PerCell |  | n1 |
|  | spCellInclusion |  | N/A |
| ltm-ConfigComplete | |  | True | Candidate cell’s configuration is complete configuration |
| T1 | | s | 2 |  |
| T2 | | s | ≤2 |  |

Table A.7.6.Y.1.2-1: Cell specific test parameters for SSB based inter-frequency L1-RSRP LTM measurement with measurement gap test in FR2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Config | Unit | Cell 1 | Cell 2 |
| SSB GSCN | 1~2 |  | freq1 | freq 2 |
| Duplex mode | 1~2 |  | TDD | |
| TDD Configuration | 1~2 |  | TDDConf.3.1 | |
| BWchannel | 1~2 | MHz | 100: NRB,c = 66 | |
| Data RBs allocated | 1~2 |  | 66 | |
| PDSCH/PDCCH subcarrier spacing | 1~2 | KHz | 120 | |
| PUCCH/PUSCH subcarrier spacing | 1~2 | KHz | 120 | |
| PDSCH Reference measurement channel | 1 |  | SR.3.2 TDD | N/A |
| 2 | SR.3.3 TDD | N/A |
| RMSI CORESET Reference Channel | 1 |  | CR.3.1 TDD | N/A |
| 2 | CR.3.2 TDD | N/A |
| Dedicated CORESET Reference Channel | 1 |  | CCR.3.1 TDD | N/A |
| 2 | CCR.3.7 TDD | N/A |
| SSB configuration | 1 |  | SSB.3 FR2 | SSB.3 FR2 |
|  | 2 | SSB.4 FR2 | SSB.4 FR2 |
| OCNG Patterns | 1~2 |  | OP.1 | OP.1 |
| Initial BWP Configuration | 1~2 |  | DLBWP.0.1  ULBWP.0.1 | |
| Dedicated BWP configuration | 1~2 |  | DLBWP.1.3  ULBWP.1.3 | |
| SMTC configuration | 1~2 |  | SMTC.1 | SMTC.1 |
| TRS Configuration | 1~2 |  | TRS.2.1 TDD | N/A |
| PDCCH/PDSCH TCI Configuration | 1~2 |  | TCI.State.2 | N/A |
| EPRE ratio of PSS to SSS | 1~2 | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS |  |  |
| EPRE ratio of PBCH to PBCH DMRS |  |  |
| EPRE ratio of PDCCH DMRS to SSS |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS |  |  |
| EPRE ratio of PDSCH DMRS to SSS |  |  |
| EPRE ratio of PDSCH to PDSCH DMRS |  |  |
| EPRE ratio of OCNG DMRS to SSSNote 1 |  |  |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |  |  |
| Propagation condition | 1~2 |  | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | |

Table A.7.6.Y.1.2-3: SSB specific test parameters for neighbor cell

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Config** | **Unit** | **Cell 1** | | **Cell 2** | |
|  |  |  | **T1** | **T2** | **T1** | **T2** |
| Angle of arrival configuration | 1~2 |  | Setup 1 according to A.3.15.1 | | | |
|  | |  | |
| Beam AssumptionNote 4 | 1~2 |  | Rough | | Rough | |
| BBNote 5 | 1~2 | dB | 16.5 | 16.5 | -1.5 | 16.5 |
| SSB\_RP Note3 | 1 | dBm/SSB SCS | -85 | -85 | -103 | -85 |
|  | 2 |  | -82 | -82 | -100 | -82 |
| Io Note3 | 1 | dBm/95.04MHz | -56 | -56 | -74 | -56 |
|  | 2 |  | -56 | -56 | -74 | -56 |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 5: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | | |

##### A.7.6.Y.1.3 Test Requirements

The UE shall send L1-RSRP report every 320 slots in T2. The UE shall start to report a larger L1-RSRP value of Cell 2 in no later than 1280 ms plus 320 slots from the beginning of time period T2. UE shall send L1-RSRP report including the valid results for Cell 2 while meeting the accuracy requirements defined in clause 10.1.20Y.

The reported L1-RSRP value shall include the Rx antenna gain in the range of -10 to +20 dB.

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

End of Change 20

Start of Change 21

### A.7.6.Z LTM Inter-frequency L1-RSRP measurement without measurement gap

#### A.7.6.Z.1 Inter-frequency SSB based L1-RSRP measurement without measurement gap in FR2

##### A.7.6.Z.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE supporting [FG 39-2: SSB based inter-frequency L1-RSRP measurements without measurement gaps] makes correct reporting of inter-frequency L1-RSRP measurement without gap for LTM. This test will partly verify the L1-RSRP measurement requirements in clause 9.15.6, with the testing configurations in Tables A.7.6.Z.1.1-1, A.7.6.Z.1.2-1, A.7.6.Z.1.2-2, A.7.6.Z.1.2-3 and A.7.6.Z.1.2-4.

The AoA setup of FR2 cell for this test is Setup 1 as defined in clause A.3.15.

Table A.7.6.Z.1.1-1: Applicable NR configurations for SSB based inter-frequency L1-RSRP LTM measurement without gap in FR2

|  |  |
| --- | --- |
| Config | Description |
| 1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations  Note 2: Target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

##### A.7.6.Z.1.2 Test parameters

There are two cells in the test, Cell 1 is the PCell on NR RF channel number 1 and Cell 2 is a neighbor cell NR RF channel number 2. The SSB of Cell 2 is completely within UE’s active BWP BW. The RBs containing SSB from Cell 1 and Cell 2 should be different in frequency location within the cell bandwidth. The test parameters for Cell 1 are given in Table A.7.6.Z.1.2-1. The test parameters for Cell 2 are given in Table A.7.6.Z.1.2-2 and Table A.7.6.Z.1.2-3.

There are two tests in the test case, test 1 and test 2:

* In test 1, time offset between cells is within CP length.
* In test 2, time offset between cells is larger than CP length.

UE not capable of [RTD>CP] is only required to pass test 1. Otherwise, it is only required to pass test 2.

The test consists of two successive time periods, with time duration of T1 and T2 respectively. SSB\_RP of Cell 2 in T1 and T2 are different. No measurement gap is configured in the test.

Prior to the start of the time duration T1,

- UE is connected to Cell 1 (PCell) on RF channel 1 (PCC).

- A measurement object is configured for the RF channel 2, and it is indicated to the UE that event-triggered reporting with Event A3 is used. Before the start of the T1, event is triggered, and UE has sent a measurement report for the Cell 2 with SSB Index.

- UE is provided with *LTM-Candidate-r18* for Cell 2*.*

- UE is configured with SSB-based L1-RSRP measurements and periodic L1-RSRP measurement reports on candidate cell (Cell 2) in PUCCH format 2.

At the beginning of T2, SSB\_RP of Cell 2 changes to a different value from T1. T2 starts at the beginning of a frame with an odd SFN.

Table A.7.6.Z.1.2-1: General test parameters for SSB based inter-frequency L1-RSRP LTM measurement test in FR2

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | | Comment |
| Test 1 | Test 2 |
| Active cell | |  | Cell 1 | |  |
| Neighbouring cell | |  | Cell 2 | | Cell 2 is the candidate cell |
| RF Channel Number | |  | 1: Cell 1  2: Cell 2 | |  |
| A3-Offset | | dB | -30 | |  |
| Hysteresis | | dB | 0 | |  |
| Time To Trigger | | ms | 0 | |  |
| Filter coefficient | |  | 0 | | L3 filtering is not used |
| maxNrofRS-IndexesToReport | |  | 1 | |  |
| includeBeamMeasurements | |  | True | |  |
| DRX | |  | OFF | | DRX is not used |
| Time offset between cells | |  | 0.2 μs | 2μs | The timing of Cell 2 is later than the timing of Cell 1 |
| LTM-CSI-ReportConfig | L1-RSRP reporting period | slot | 320 | | Periodic L1-RSRP reporting configured |
| nrOfReportedCells |  | n1 | | Report candidate cell’s (Cell 2) L1-RSRP measurement results. |
| nrOfReportedRS-PerCell |  | n1 | |
|  | spCellInclusion |  | N/A | |
| ltm-ConfigComplete | |  | True | | Candidate cell’s configuration is complete configuration |
| T1 | | s | 1.5 | |  |
| T2 | | s | ≤2 | |  |

Table A.7.6.Z.1.2-2: Cell specific test parameters for for SSB based inter-frequency L1-RSRP LTM measurement test in FR2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Config | Unit | Cell 1 | Cell 2 |
| SSB GSCN | 1~2 |  | freq1 | freq2 |
| Duplex mode | 1~2 |  | TDD | |
| TDD Configuration | 1~2 |  | TDDConf.3.1 | |
| BWchannel | 1~2 | MHz | 100: NRB,c = 66 | |
| Data RBs allocated | 1~2 |  | 66 | |
| PDSCH/PDCCH subcarrier spacing | 1~2 | KHz | 120 | |
| PUCCH/PUSCH subcarrier spacing | 1~2 | KHz | 120 | |
| PDSCH Reference measurement channel | 1 |  | SR.3.2 TDD | N/A |
| 2 | SR.3.3 TDD | N/A |
| RMSI CORESET Reference Channel | 1 |  | CR.3.1 TDD | N/A |
| 2 | CR.3.2 TDD | N/A |
| Dedicated CORESET Reference Channel | 1 |  | CCR.3.1 TDD | N/A |
| 2 | CCR.3.7 TDD | N/A |
| SSB configuration | 1 |  | SSB.3 FR2 | |
|  | 2 | SSB.4 FR2 | |
| OCNG Patterns | 1~2 |  | OP.4 | N/A |
| Initial BWP Configuration | 1~2 |  | DLBWP.0.1  ULBWP.0.1 | |
| Dedicated BWP configuration | 1~2 |  | DLBWP.1.3  ULBWP.1.3 | |
| SMTC configuration | 1~2 |  | SMTC.1 | |
| TRS Configuration | 1~2 |  | TRS.2.1 TDD | N/A |
| PDCCH/PDSCH TCI Configuration | 1~2 |  | TCI.State.2 | N/A |
| EPRE ratio of PSS to SSS | 1~2 | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS |  |  |  |  |
| EPRE ratio of PBCH to PBCH DMRS |  |  |  |  |
| EPRE ratio of PDCCH DMRS to SSS |  |  |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS |  |  |  |  |
| EPRE ratio of PDSCH DMRS to SSS |  |  |  |  |
| EPRE ratio of PDSCH to PDSCH DMRS |  |  |  |  |
| EPRE ratio of OCNG DMRS to SSSNote 1 |  |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |  |  |  |  |
| Propagation condition | 1~2 |  | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | |

Table A.7.6.Z.1.2-3: NR OTA Cell specific test parameters for SSB based inter-frequency L1-RSRP LTM measurement without measurement gap in FR2

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Config** | **Unit** | **Cell 1** | | **Cell 2** | |
|  |  |  | **T1** | **T2** | **T1** | **T2** |
| Angle of arrival configuration | 1~2 |  | Setup 1 according to A.3.15.1 | | | |
|  | |  | |
| Beam AssumptionNote 3 | 1~2 |  | Rough | | Rough | |
| BBNote 4 | 1~2 | dB | -1.5 | 16.5 | -1.5 | 16.5 |
| SSB\_RP Note2 | 1 | dBm/SSB SCS | -103 | -85 | -103 | -85 |
|  | 2 |  | -100 | -82 | -100 | -82 |
| Io Note2 | 1 | dBm/95.04MHz | -74 | -56 | -74 | -56 |
|  | 2 |  | -74 | -56 | -74 | -56 |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Es/Iot, SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 4: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | | |

##### A.7.6.Z.1.3 Test Requirements

The UE shall send L1-RSRP report every 320 slots in T2. No later than 960 ms plus 320 slots from the beginning of time period T2, UE shall send L1-RSRP report including the valid results for Cell 2 while meeting the accuracy requirements defined in clause 10.1.20Y.

The reported L1-RSRP value shall include the Rx antenna gain in the range of -10 to +20 dB.

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

End of Change 21

Start of Change 22

### A.7.7.x LTM L1-RSRP measurement

#### A.7.7.x.1 SSB based inter-frequency L1-RSRP measurement

##### A.7.7.x.1.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clause [10.1.20.x] for inter-frequency L1-RSRP measurements based on SSB with the testing configurations for NR cells in Table A.7.7.x.1.1-1.

Prior to the start of the test,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC).

- UE is provided with *LTM-Candidate-r18* for Cell 2*.*

- A measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A4 is used.

- UE is configured with SSB-based L1-RSRP measurements and periodic L1-RSRP measurement reports on candidate cell (Cell 2) in PUCCH format 2.

- The UE has reported L3 measurement results and performed SSB based L1-RSRP measurement on Cell 2.

Table A.7.7.x.1.1-1: Applicable NR configurations for FR2 SSB based L1-RSRP test

|  |  |
| --- | --- |
| Config | Description |
| 1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band | |

##### A.7.7.x.1.2 Test parameters

In this set of test cases there are two cells in the test, PCell (Cell 1) and a FR2 neighbour cell (Cell 2) on a different frequency than the PCell. The test parameters for the Cell 1 and Cell 2 are given in Table A.7.7.x.1.2-1 and Table A.7.7.x.1.2-2 below. The absolute accuracy of inter-frequency L1-RSRP measurements are tested by using the parameters in Table A.7.7.X.1.2-1 and Table A.7.7.X.1.2-2. The inter-frequency L1-RSRP measurements are supported by a measurement gap.

Before the test, UE is configured L1-RSRP measurement on SSB0 of Cell 2.

Table A.7.7.x.1.2-1: FR2 SSB based inter-frequency L1-RSRP general test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | Test 1 | | Test 2 | |
|  |  |  | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| SSB ARFCN | 1~2 |  | freq1 | freq2 | freq1 | freq2 |
| BWchannel | 1~2 |  | 100:  NRB,c = 66 | | 100:  NRB,c = 66 | |
| Data RBs allocated | 1~2 |  | 66 | | 66 | |
| Gap pattern ID | 1~2 |  | 13 | | 13 | |
| Measurement gap offset | 1~2 |  | 39 | | 39 | |
| Duplex mode | 1~2 |  | TDD | | TDD | |
| TDD configuration | 1~2 |  | TDDConf.3.1 | | TDDConf.3.1 | |
| PDSCH Reference measurement channel | 1 |  | SR.3. 2 TDD | - | SR.3. 2 TDD | - |
| 2 | SR.3.3 TDD | SR.3.3 TDD |
| RMSI CORESET Reference Channel | 1 |  | CR.3.1 TDD | - | CR.3.1 TDD | - |
| 2 | CR.3.2 TDD | CR.3.2 TDD |
| Control Channel RMC | 1 |  | CCR.3.1 TDD | - | CCR.3.1 TDD | - |
| 2 | CCR.3.7 TDD | CCR.3.7 TDD |
| SSB configuration | 1 |  | SSB.3 FR2 | | SSB.3 FR2 | |
|  | 2 |  | SSB.4 FR2 | | SSB.4 FR2 | |
| PDSCH/PDCCH subcarrier spacing | 1~2 | kHz | 120 | | 120 | |
| OCNG Patterns | 1~2 |  | OP.1 | | OP.1 | |
| Initial BWP Configuration | 1~2 |  | DLBWP.0.1  ULBWP.0.1 | | DLBWP.0.1  ULBWP.0.1 | |
| Dedicated BWP configuration | 1~2 |  | DLBWP.1.3  ULBWP.1.3 | | DLBWP.1.3  ULBWP.1.3 | |
| TRS Configuration | 1~2 |  | TRS.2.1 TDD | | TRS.2.1 TDD | |
| PDCCH/PDSCH TCI Configuration | 1~2 |  | TCI.State.2 | | TCI.State.2 | |
| SMTC configuration | 1~2 |  | SMTC.1 | | SMTC.1 | |
| LTM reportConfigType | 1~2 |  | periodic | - | periodic | - |
| ltm-ResourcesForChannelMeasurement | 1~2 |  | SSB0 of Cell 2 | - | SSB0 of Cell 2 | - |
| LTM L1-RSRP reporting period | 1~2 |  | slot320 | - | slot320 | - |
| nrOfReportedCells | 1~2 |  | 1 | - | 1 | - |
| nrOfReportedRS-PerCell | 1~2 |  | 1 | - | 1 | - |
| spCellInclusion | 1~2 |  | N/A | - | N/A | |
| Time offset between Cell 2 and Cell 1 | 1~2 | μs | 3 | | 3 | |
| EPRE ratio of PSS to SSS | 1~2 | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS |  |  |  |  |  |  |
| EPRE ratio of PBCH to PBCH DMRS |  |  |  |  |  |  |
| EPRE ratio of PDCCH DMRS to SSS |  |  |  |  |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS |  |  |  |  |  |  |
| EPRE ratio of PDSCH DMRS to SSS |  |  |  |  |  |  |
| EPRE ratio of PDSCH to PDSCH DMRS |  |  |  |  |  |  |
| EPRE ratio of OCNG DMRS to SSSNote 1 |  |  |  |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |  |  |  |  |  |  |
| Propagation condition | 1~2 | - | AWGN | AWGN | AWGN | AWGN |
| Antenna configuration | 1~2 | - | 1x2 | 1x2 | 1x2 | 1x2 |
| Note 1: OCNG shall be used such that 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  to be fulfilled. | | | | | | |

Table A.7.7.X.1.2-2: FR2 SSB based inter-frequency L1-RSRP OTA related test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | Test 1 | | Test 2 | |
|  |  |  | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Angle of arrival configuration | 1~2 |  | Setup 1 according to A.3.15.1 | | Setup 1 according to A.3.15.1 | |
| Assumption for UE beamsNote 4 | 1~2 |  | Rough | | Rough | |
| Note1 | 1 | dBm/15kHzNote4 | -100 | | n.a. | |
| 2 |
| Note1 | 1 | dBm/SCSNote4 | -91 | | n.a. | |
| 2 | -88 | | n.a. | |
|  | 1~2 | dB | 10 | -2 | n.a. | |
| Note2 | 1~2 | dB | 10 | -2 | n.a. | |
| SSB\_RPNote2 | 1 | dBm/SCS | -81 | -93 | As in Table B.2.4-2 | |
| 2 | -78 | -90 | As in Table B.2.4-2 | |
| IoNote2 | 1 | dBm/95.04 MHz Note3 | -51.57 | -59.86 | SSB\_RP+28.98 | |
| 2 | -51.57 | -59.86 | SSB\_RP+28.98 | |
| Note 1: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: SSB\_RP, Es/Iot, Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | |

##### A.7.7.X.1.3 Test Requirements

The L1-RSRP measurement accuracy for Cell 2 shall fulfil the absolute requirements in clause 10.1.20Y.

Test 1:

Absolute accuracy of SSB0 in Cell 2. The UE is deemed to meet the requirement if the reported L1-RSRP is in the range shown in Table A.7.7.x.1.3-1.

Test 2:

Absolute accuracy of SSB0 in Cell 2. The UE is deemed to meet the requirement if the reported L1-RSRP is in the range shown in Table A.7.7.x.1.3-1.

Table A.7.7.X.1.3-1: L1-RSRP absolute accuracy test requirement

|  |  |
| --- | --- |
|  | Test requirement Notes1,2,3 |
| SSB0 | SSB\_RP0 -δ + Gmin ≤ Reported RSRP(dBm) ≤ SSB\_RP0 +δ + Gmax |
| Note 1: SSB\_RPn is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the SSB n under consideration  Note 2: δ is the RSRP absolute accuracy requirement from Table 10.1.20.1.1-1, selected according to the Io used in the test  Note 3: Gmin and Gmax are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class | |

End of Change 22