**3GPP TSG-WG4 Meeting #111R4-2408894**

**Fukuoka City, Fukuoka , Japan, 20th – 24th May, 2024**

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  |  | **CR** | **4541** | **rev** |  | **Current version:** |  |  |
|  | | | | | | | | |
| *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:*** |  | | | | | | | | | |
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| ***Source to WG:*** | Samsung | | | | | | | | | |
| ***Source to TSG:*** |  | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_HST\_FR2\_enh-Perf | | | | |  | ***Date:*** | | |  |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | |  |
|  | *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. The big CR is on top of the draft big CR R4-2406408 endorsed in RAN4 #110-bis post meeting. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | 1. RRM test cases for NR HST FR2 endorsed in the following draft CRs are included and consolidated 2. R4-2406408 Draft Big CR to TS 38.133 on Rel-18 HST FR2 RRM performance requirements 3. Endorsed draft CRs in RAN4 #111 meeting | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | No test cases for NR FR2 HST in Rel-18. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | A.7.1.1.8, A.7.5.8.3, A.7.6.1.X, A.7.6.2.X4, A.7.6.3.X | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | | **X** |  | Test specifications | | | | TS/TR ... CR 38.533 | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | | All Clauses are new | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | | 1st version. | | | | | | | | |

==========================Start of change 1 =============================

#### A.7.1.1.8 Cell reselection to FR2 inter-frequency NR case for UE configured with *highSpeedMeasFlagFR2-r17*

##### A.7.1.1.8.1 Test Purpose and Environment

This test is to verify the requirement for the inter frequency NR cell reselection requirements for UE that supports Idle mode inter-frequency measurement enhancement for HST in FR2 and configured with *highSpeedMeasFlagFR2-r17* specified in clause 4.2.2.4.

##### A.7.1.1.8.2 Test Parameters

The test scenario comprises of 2 cells on 2 different NR carriers respectively as given in tables A.7.1.1.8.2-1, A.7.1.1.8.2-2 and A.7.1.1.8.2-3. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas and cell 2 is of higher priority than cell 1. Note that the value of configured *highSpeedMeasFlagFR2-r17* is set to *set2*.

Table A.7.1.1.8.2-1: Supported test configurations

|  |  |  |
| --- | --- | --- |
| Configuration | Description for serving cell | Description for target cell |
| 1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode | 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | | |

Table A.7.1.1.8.2-2: General test parameters for FR2 inter frequency NR cell re-selection test case

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Value | Comment |
| Initial condition | Active cell |  | 1, 2 | Cell2 | The UE camps on cell 2 in the initial phase and during T1 period the UE reselects to cell 1. |
|  | Neighbour cell |  | 1, 2 | Cell1 |  |
| T1 end condition | Active cell |  | 1, 2 | Cell1 | The UE shall perform reselection to cell 1 during T1. |
|  | Neighbour cells |  | 1, 2 | Cell2 |  |
| T3 end condition | Active cell |  | 1, 2 | Cell2 | The UE shall perform reselection to cell 2 with higher priority during T3. |
|  | Neighbour cell |  | 1, 2 | Cell1 |  |
| RF Channel Number | |  | 1, 2 | 1, 2 |  |
| Time offset between cells | |  | 1, 2 | 3 μs | Synchronous cells are assumed. |
| Access Barring Information | | - | 1, 2 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | |  | 1 | SSB.1 FR2 |  |
|  | |  | 2 | SSB.2 FR2 |  |
| SMTC configuration | |  | 1, 2 | SMTC.1 | SMTC is set with 20ms periodicity on both frequencies. |
| DRX cycle length | | s | 1, 2 | 0.32 | The value shall be used for all cells in the test. |
| PRACH configuration index | |  | 1, 2 | 190 | The detailed configuration is specified in TS 38.211 clause 6.3.3.2. |
| rangeToBestCell | |  | 1, 2 | Not configured |  |
| highSpeedMeasFlagFR2-r17 | |  | 1, 2 | Set2 | Set2 deployment is configured and the UE FR2 scaling factor is considered as N1 = 6. |
| T1 | | s | 1, 2 | 10 | T1 needs to be defined so that cell re-selection reaction time is taken into account. |
| T2 | | s | 1, 2 | >7 | During T2, cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that cell 2 has not been detected by the UE prior to the start of period T3. |
| T3 | | s | 1, 2 | 70 | T3 needs to be defined so that cell re-selection reaction time is taken into account. |

Table A.7.1.1.8.2-3: Cell specific test parameters for FR2 inter frequency NR cell re-selection test case in AWGN

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Cell 1** | | | **Cell 2** | | |
| **T1** | **T2** | **T3** | **T1** | **T2** | **T3** |
| TDD configuration |  | 1, 2 | TDDConf.3.1 | | | TDDConf.3.1 | | |
| PDSCH RMC configuration |  | 1, 2 | SR.3.1 TDD | | | SR.3.1 TDD | | |
| RMSI CORESET parameters |  | 1, 2 | CR.3.1 TDD | | | CR.3.1 TDD | | |
| RMSI CORESET RMC configuration |  | 1, 2 | CCR.3.1 TDD | | | CCR.3.1 TDD | | |
| OCNG Pattern |  | 1, 2 | OP.1 defined in A.3.2.1 | | | OP.1 defined in A.3.2.1 | | |
| Initial DL BWP configuration |  | 1, 2 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration |  | 1, 2 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS |  | 1, 2 | SSB | | | SSB | | |
| Qrxlevmin | dBm/SCS | 1 | -140 | | | -140 | | |
| 2 | -137 | | | -137 | | |
| Pcompensation | dB | 1, 2 | 0 | | | 0 | | |
| Qhysts | dB | 1, 2 | 0 | | | 0 | | |
| Qoffsets, n | dB | 1, 2 | 0 | | | 0 | | |
| Cell\_selection\_and\_  reselection\_quality\_measurement |  | 1, 2 | SS-RSRP | | | SS-RSRP | | |
| AoA setup |  | 1, 2 | Setup 1 defined in A.3.15.1 | | | Setup 1 defined in A.3.15.1 | | |
| Beam assumptionNote 4 |  | 1,2 | Rough | | | Rough | | |
| Note 5 | dB | 1 | 9.95 | 9.95 | 7.45 | -11.05 | -infinity | 7.95 |
| 2 |
| Note2 | dBm/SCS | 1 | -93 | | | -93 | | |
| 2 | -90 | | | -90 | | |
| Note2 | dBm/15 kHz | 1 | -102 | | | -102 | | |
| 2 |
|  | dB | 1 | 10.5 | 10.5 | 8 | -10.5 | -infinity | 8.5 |
| 2 |
| SS-RSRP Note3 | dBm/SCS | 1 | -82.5 | -82.5 | -85 | -103.5 | -infinity | -84.5 |
| 2 | -79.5 | -79.5 | -82 | -100.5 | -infinity | -81.5 |
| Io | dBm/95.04 MHz | 1, 2 | -53.11 | -53.11 | -55.34 | -63.61 | -63.98 | -54.91 |
| Treselection | s | 1, 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| SnonintrasearchP | dB | 1, 2 | 50 | | | 50 | | |
| Threshx, highP | dB | 1, 2 | 48 | | | 48 | | |
| Threshserving, lowP | dB | 1, 2 | 44 | | | 44 | | |
| Threshx, lowP | dB | 1, 2 | 50 | | | 50 | | |
| Propagation Condition |  | 1, 2 | AWGN | | | AWGN with 9722 Hz | | |
| 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: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.  Note 5: Calculation of Es/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.7.1.1.8.3 Test Requirements

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

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

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

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

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

NOTE: The cell re-selection delay to a higher priority cell can be expressed as: Thigher\_priority\_search + Tevaluate, NR\_ inter\_HST + TSI-NR, and to a lower priority cell can be expressed as: Tevaluate, NR\_ inter\_HST + TSI-NR,

Where:

Thigher\_priority\_search See clause 4.2.2.7

Tevaluate, NR\_ inter\_HST See Table 4.2.2.4-2a in clause 4.2.2.4

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

This gives a total of 67 s, allow 68 s for the cell re-selection delay to a higher priority cell and 7 s for the cell re-selection delay to a lower priority cell in the test case, which we allow 8 s.

==========================End of change 1 =============================

==========================Start of change 2 =============================

#### A.7.5.8.3 MAC-CE based active TCI state switch in HST FR2 scenario

##### A.7.5.8.3.1 NR PCell FR2 HST active TCI state switch for a known TCI state

Editor’s note: The text of the clause is fully omitted due to no changes in it.

##### A.7.5.8.3.2 NR PCell FR2 HST active TCI state switch for PC6 UE supporting [*highSpeedTCISwitchEnhMAC-CE-FR2-r18*] a known TCI state

###### A.7.5.8.3.2.1 Test Purpose and Environment

The purpose of this test is to verify the active TCI state switch delay requirement defined in clause 8.10.3 applicable for FR2 power class 6 UE. Supported test configuration is shown in Table A.7.5.8.3.2.1-1. Furthermore, the purpose of this test is also to verify the timing adjustment requirement specified in clause 7.1.2.3 provided *highSpeedMeasFlagFR2-r17* is configured and [*highSpeedTCISwitchEnhMAC-CE-FR2-r18*] is enabled for UE supporting FR2 power class 6and [*highSpeedTCISwitchEnhMAC-CE-FR2-r18*] capability. [*R18 enhanced MAC-CE indication*] is indicated as ‘0’ for the TCI state switch.

The test scenario comprises of one NR PCell (Cell 1) as given in Table A.7.5.8.3.2.1-2. Cell-specific parameters of NR PCell are specified in Table A.7.5.8.3.2.1-3 below. The OTA related test parameters for FR2 are shown in Table A.7.5.8.3.2.1-4. During the test, *highSpeedMeasFlagFR2-r17* is configured to be *set2* and broadcast to UE.

PDCCHs indicating new transmissions shall be sent continuously on PCell to ensure that the UE would have ACK/NACK sending.

Before the test starts,

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

- UE is configured with 2 different TCI states for PCell, PDCCH TCI state 0 (QCL’d to SSB0) and TCI state 1 (QCL’d to SSB1), in Cell 1 before starting the test.

- UE is indicated in TCI state 0 as the active PDCCH TCI state

The test consists of two time periods, T1 and T2. Figure A.7.5.8.3.2.1-1 and Figure A.7.5.8.3.2.1-2 show the Time multiplexed (allocation in Frequency is symbolic) downlink transmissions from each Angle of Arrival. During T1 only SSB to which PDCCH-TCI-state0 is QCL’d is transmitted. At the beginning of T2, the SSB corresponding to TCI state 1 starts transmitting. The UE is configured to provide periodic L1-RSRP reports. In slot n which is within [1280ms] of UE providing L1-RSRP report with results for both SSB0 and SSB1, UE receives a MAC-CE command indicating a switch to TCI state 1 with [*R18 enhanced MAC-CE indication*] indicated as ‘0’. *tci-PresentInDCI* is not configured in the PDSCH configuration, i.e. TCI state for the PDSCH is identical to the PDCCH TCI state. After the TCI state switch, the UE transmit timing accuracy shall be measured by the test equipment by using the SRS defined in Table A.7.5.8.3.2-5. TCI state 1 has relative timing delay of [4.5\*64\*Tc] compared to TCI state 0.

The test equipment verifies that

- UE can be scheduled on PCell on TCI state 0 till n+ THARQ +3 ms.

- the TCI state switch time in PCell by scheduling the UE on TCI state 1 after slot n + THARQ + 3 ms + Tfirst-SSB + TSSB-proc.

- the UE transmission timing immediately after TCI state switch shall follow the requirements as specified in clause 7.1.2.3.

Table A.7.5.8.3.1.1-1: Supported test configurations

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

Table A.7.5.8.3.2.1-2: General test parameters for TCI state switch

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| NR RF Channel Number |  | 1 | One NR radio channel is used for this test |
| Active PCell |  | Cell 1 | PCell on RF channel number 1. |
| CP length |  | Normal |  |
| DRX |  | OFF |  |
| T1 | s | 0.2 |  |
| T2 | s | 0.2 |  |

Table A.7.5.8.3.2.1-3: NR Cell specific test parameters for TCI state switch

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Cell 1 |
| Frequency Range |  | FR2 |
| Duplex mode |  | TDD |
| TDD configuration |  | TDDConf.3.1 |
| BWchannel |  | 100 MHz: NRB,c = 66 |
| Data RBs allocated |  | 66 |
| Initial DL BWP Configuration |  | DLBWP.0.2 |
| Dedicated DL BWP Configuration |  | DLBWP.1.1 |
| Initial UL BWP Configuration |  | ULBWP.0.2 |
| Dedicated UL BWP Configuration |  | ULBWP.1.1 |
| PDSCH Reference measurement channel |  | SR.3. 2 TDD |
| RMSI CORESET parameters |  | CR.3.1 TDD |
| Dedicated CORESET parameters |  | CCR.3.1 TDD |
| OCNG Patterns |  | OP. 5 |
| SSB Configuration |  | SSB.1 FR2 |
| SMTC Configuration |  | SMTC.1 |
| TCI State 0 |  | TCI.State.0 |
| TCI State 1 |  | TCI.State.1 |
| TRS Configuration |  | TRS.2.1 TDD |
| Correlation Matrix and Antenna Configuration |  | 1x2 |
| EPRE ratio of PSS to SSS | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS |  |  |
| EPRE ratio of PBCH to PBCH DMRS |  |  |
| EPRE ratio of PDCCH DMRS to SSS |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS |  |  |
| EPRE ratio of PDSCH DMRS to SSS |  |  |
| EPRE ratio of PDSCH to PDSCH |  |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |  |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |  |  |
| Propagation Condition |  | [AWGN with 9722 Hz frequency offset] |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. | | |

Table A.7.5.8.3.2.1-4: OTA related test parameters for TCI state switch

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Cell 1 | | | |
|  |  | SSB0 | | SSB1 | |
|  |  | T1 | T2 | T1 | T2 |
| Angle of arrival configuration |  | [Setup 1 according to clause A.3.15.1] | | | |
| Assumption for UE beams Note 4 |  | Rough | | | |
| Ês | dBm/SCS | -80.6 | -80.6 | -Infinity | -80.6 |
| SS B\_RP Note 1 | dBm/ SCS | -80.6 | -80.6 | -Infinity | -80.6 |
| BB Note 5 | dB | 8.3 | 8.3 | -Infinity | 8.3 |
| IoNote1 | dBm/95.04 MHz Note4 | -56.0 | -56.0 | - Infinity | -56.0 |
| Note 1: SS B\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 2: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 3: As observed with 0dBi gain antenna at the center 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.  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 6.2.1.6-4. | | | | | |

Table A.7.5.8.3.2.1-5: Sounding Reference Symbol Configuration

|  |  |  |
| --- | --- | --- |
| Field | Value | Comment |
| c-SRS | 16 | Frequency hopping is disabled |
| b-SRS | 0 |  |
| b-hop | 0 |  |
| freqDomainPosition | 0 | Frequency domain position of SRS |
| freqDomainShift | 0 |  |
| groupOrSequenceHopping | neither | No group or sequence hopping |
| SRS-PeriodicityAndOffset | sl5=0 | Once every 5 slots |
| pathlossReferenceRS | ssb-Index=0 | SSB #0 is used for SRS path loss estimation |
| usage | Codebook | Codebook based UL transmission |
| startPosition | 0 | resourceMapping setting. SRS on last symbol of slot, and 1symbols for SRS without repetition. |
| nrofSymbols | n1 |  |
| repetitionFactor | n1 |  |
| combOffset-n2 | 0 | transmissionComb setting |
| cyclicShift-n2 | 0 |  |
| nrofSRS-Ports | port1 | Number of antenna ports used for SRS transmission |
| Note: For further information see clause 6.3.2 in TS 38.331 [2]. | | |



Figure A.7.5.8.3.2.1-1: Time multiplexed downlink transmissions during T1



Figure A.7.5.8.3.2.1-2: Time multiplexed downlink transmissions during T2

###### A.7.5.8.3.2.2 Test Requirements

During T2, UE shall send L1-RSRP report with results for both SSB0 and SSB1.

After the TCI state switch, the UE transmission timing immediately after TCI state switch shall follow the requirements as specified in clause 7.1.2.3.

After receiving [*R18 enhanced MAC-CE indication*] indicated as ‘0’in slot n, UE shall:

- be able to continue to receive on TCI state 0 till n+ THARQ +3 ms

- be able to start receiving on TCI state 1 after n+ THARQ +5 ms + Tfirst-SSB.

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

==========================End of change 2 =============================

==========================Start of change 3 =============================

A.7.6.1.X *SA event triggered reporting test without gap under non-DRX for* *power class 6 UE supporting [measurementEnhancementCAInterFreqFR2-r18]*

A.7.6.1.X.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA SCC intra-frequency NR cell measurement requirements for FR2 power class 6 UE which is configured with *highSpeedMeasFlagFR2-r17* and supports [*measurementEnhancementCAInterFreqFR2-r18*] in clause 9.2.5.

The Supported test configurations are given in Table A.7.6.1.X.1.1-1. The test parameters are given in Tables A.7.6.1.X.1.1-2 and cell-specific parameters in A.7.6.1.X.1.1-3 below. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A6 is used. The test consists of two successive time periods, with duration of T1 and T2 respectively.

There are two carriers both in FR2, with one cell on the PCC and 2 cells on SCC. Cell 1 and Cell 2 have constant signal levels throughout the test. At time T2 Cell 3 is turned on. Before the test starts the UE is connected to Cell 1 (PCell) on radio channel 1 (PCC) with configured and activated SCell (SCell1) on radio channel 2 (SCC1). The UE is not aware of Cell 3 on radio channel 2 (SCC1).

**Table A.7.6.1.X.1-1 SA event triggered reporting tests without SSB index reading for FR2-FR2**

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

**Table A.7.6.1.X.1-2: General test parameters for SA event triggered reporting test without gap under non-DRX for UE supporting [measurementEnhancementCAInterFreqFR2-r18]**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Comment** |
| *highSpeedMeasFlagFR2-r17* |  | Set2 | *highSpeedMeasFlagFR2-r17* = set2 is configured |
| NR RF Channel Number |  | 1, 2 | Two FR2 NR carrier frequencies are used. |
| Active cell |  | NR cell 1 (Pcell) | NR Cell 1 is on NR RF channel number 1. |
| Active cell |  | NR cell 2 (Scell) | NR Cell 2 is on NR RF channel number 2. |
| Neighbour cell |  | NR cell 3 | NR cell 2 is on NR RF channel number 2. |
| SMTC configuration |  | SMTC.1 | As specified in clause A.3.11 |
| A6-Offset | dB | -11 |  |
| Hysteresis | dB | 0 |  |
| CP length |  | Normal |  |
| TimeToTrigger | s | 0 |  |
| Filter coefficient |  | 0 | L3 filtering is not used |
| DRX |  | OFF | DRX is not used |
| Time offset between serving and neighbour cells |  | 3s | Synchronous cells. |
| T1 | s | 5 |  |
| T2 | s | 4.5 |  |

**Table A.7.6.1.X.1-3: Cell specific test parameters for SA event triggered reporting test without gap under non-DRX for UE supporting [measurementEnhancementCAInterFreqFR2-r18]**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell 1** | | **Cell 2** | | **Cell 3** | |
|  | |  | **T1** | **T2** | **T1** | **T2** | **T1** | **T2** |
| AoA setup Note 1 | |  | Setup 3 as specified in clause A.3.15 | | | | | |
|  | |  | AoA1 | | AoA1 | | AoA2 | |
| Beam AssumptionNote 2 | |  | Rough | | Rough | | Rough | |
| NR RF Channel Number | |  | 1 | | 2 | | 2 | |
| Duplex mode | |  | TDD | | TDD | | TDD | |
| TDD configuration | |  | TDDConf.3.1 | | TDDConf.3.1 | | TDDConf.3.1 | |
| BWchannel | | MHz | 100: NRB,c = 66 | | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| Data RBs allocated | |  | 66 | | 66 | | 66 | |
| BWP BW | | MHz | 100: NRB,c = 66 | | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| BWP configuration | Initial DL BWP |  | DLBWP.0.1 | | DLBWP.0.1 | | N/A | |
|  | Initial UL BWP |  | ULBWP.0.1 | | ULBWP.0.1 | | N/A | |
|  | Active DL BWP |  | DLBWP.1.1 | | DLBWP.1.1 | | N/A | |
|  | Active UL BWP |  | ULBWP.1.1 | | ULBWP.1.1 | | N/A | |
| OCNG Patterns defined in A.3.2.1.1 | |  | OP.1 | | OP.5 | | N/A | |
| PDSCH Reference measurement channel | |  | SR.3.2 TDD | | SR.3.2 TDD | | - | |
| CORESET Reference Channel | |  | CR.3.1 TDD | | CR.3.1 TDD | | - | |
| SMTC configuration defined in A.3.11.1 and A.3.11.2 | |  | SMTC.1 | | SMTC.1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 | | 120 | | 120 | |
| TRS configuration | |  | TRS.2.1 TDD | | TRS.2.1 TDD | | N/A | |
| PDSCH/PDCCH TCI state | |  | TCI.State.2 | | TCI.State.2 | | N/A | |
| Ês | | dBm/SCS | -89 | -89 | -89 | -89 | -Infinity | -89 |
| SSBRP Note 3 | | dBm/SCS Note4 | -89 | -89 | -89 | -89 | -Infinity | -89 |
| BB Note5 | | dB | -0.12 | -0.12 | -0.12 | -0.12 | -Infinity | -0.12 |
| Io Note3 | | dBm/95.04 MHz Note6 | -64.41 | -64.41 | -64.41 | -64.41 | -Infinity | -64.41 |
| Propagation Condition | |  | AWGN | | | | AWGN + 19444Hz | |
| Note 1: The configuration for AoA1 and AoA2 can refer to Figure A.7.6.1.5.1.-1  Note 2: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.  Note 3: SBRP, 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: 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 ΔMBS from TS 38.101-2 [19] Table 6.2.1.3-4.  Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone. | | | | | | | | |

A.7.6.1.X.2 Test Requirements

The UE shall send one Event A6 triggered measurement report, with a measurement reporting delay less than [3420] ms from the beginning of time period T2.

The UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

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 3 =============================

========================== Start of change 4 =============================

#### A.7.6.2.X4 SA event triggered reporting tests for FR2 without SSB time index detection when DRX is not used (PCell in FR2) for FR2 power class 6 UE configured with *highSpeedMeasFlagFR2-r17*

##### A.7.6.2.X4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements for FR2 power class 6 UE which is configured with *highSpeedMeasFlagFR2-r17* and supports [*measurementEnhancementCAInterFreqFR2-r18*] in clause 9.3.4.

In this test, there are two cells: NR cell 1 as PCell in FR2 on NR RF channel 1 and NR cell 2 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.7.6.2.X4.1-1, A.7.6.2.X4.1-2, and A.7.6.2.X4.1-3.

Measurement gap pattern configuration defined in Table A.7.6.2.X4.1-2 is provided for a UE that does not support per-FR gap, and no gap pattern (Gap Pattern Id and Measurement gap offset) is configured for a UE capable of per-FR gap.

Measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

Supported test configurations are shown in table A.7.6.2.X4.1-1.

Table A.7.6.2.X4.1-1 SA event triggered reporting tests without SSB index reading for FR2-FR2

|  |  |
| --- | --- |
| Config | Description |
|  | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Table A.7.6.2.X4.1-2: General test parameters for SA inter-frequency event triggered reporting for FR2 power class 6 UE configured with *highSpeedMeasFlagFR2-r17* without SSB time index detection

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| *highSpeedMeasFlagFR2-r17* |  | Set1 | *highSpeedMeasFlagFR2-r17* = set1 is configured |
| NR RF Channel Number |  | 1, 2 | Two FR2 NR carrier frequencies are used. |
| Active cell |  | NR cell 1 | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell |  | NR cell 2 | NR cell 2 is on NR RF channel number 2. |
| Gap Pattern Id |  | 13 | As specified in clause 9.1.2-1. |
| Measurement gap offset |  | 39 |  |
| SMTC-SSB parameters |  | SSB.3 FR2 | As specified in clause A.3.10.2 |
| offsetMO | dB | 16 | Applied to NR Cell 2 measurement object |
| A3-Offset | dB | -11 |  |
| Hysteresis | dB | 0 |  |
| CP length |  | Normal |  |
| TimeToTrigger | s | 0 |  |
| Filter coefficient |  | 0 | L3 filtering is not used |
| DRX |  | OFF | DRX is not used |
| Time offset between serving and neighbour cells |  | 3μs | Synchronous cells. |
| T1 | s | 5 |  |
| T2 | s | 4.5 |  |

Table A.7.6.2.X4.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR2 power class 6 UE configured with *highSpeedMeasFlagFR2-r17* without SSB time index detection

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 1 | | Cell 2 | |
|  | |  | T1 | T2 | T1 | T2 |
| AoA setup | |  | Setup 3 as specified in clause A.3.15.3 | | | |
|  | |  | AoA1 | | AoA2 | |
| Beam AssumptionNote 7 | |  | Rough | | Rough | |
| NR RF Channel Number | |  | 1 | | 2 | |
| Duplex mode | |  | TDD | | TDD | |
| TDD configuration | |  | TDDConf.3.1 | | TDDConf.3.1 | |
| BWchannel | | MHz | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| Data RBs allocated | |  | 66 | | 66 | |
| BWP BW | | MHz | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| BWP configuration | Initial DL BWP |  | 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 | | OP.1 | |
| PDSCH Reference measurement channel | |  | SR.3.1 TDD | | - | |
| CORESET Reference Channel | |  | CR.3.1 TDD | | - | |
| SMTC configuration defined in A.3.11.1 and A.3.11.2 | |  | SMTC.1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 | | 120 | |
| TRS configuration | |  | TRS.2.1 TDD | | N/A | |
| PDSCH/PDCCH TCI state | |  | 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 | |  | 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) | |  |  | |  | |
| Ês | | dBm/SCS | -87 | -87 | -Infinity | -87 |
| SSBRP Note 3 | | dBm/SCS Note5 | -87 | -87 | -Infinity | -87 |
| BB Note 8 | | dB | 1.89 | 1.89 | -Infinity | 1.89 |
| Io Note3 | | dBm/95.04 MHz Note5 | -58.01 | -58.01 | -Infinity | -58.01 |
| Propagation Condition | |  | AWGN | | AWGN 19444Hz Note 9 | |

##### A.7.6.2.X4.2 Test Requirements

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than [1] s from the beginning of time period T2.

The UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

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 4 =============================

==========================Start of change 5 =============================

#### A.7.6.3.X SSB based L1-RSRP measurement when DRX is used for power class 6 UE supporting SimultaneousReceptionFR2HST-r18

##### A.7.6.3.X.1 Test Purpose and Environment

The purpose of this test is to verify that the power class 6 UE supporting *SimultaneousReceptionFR2HST-r18* makes correct reporting of L1-RSRP measurement when *highSpeedMeasFlagFR2-r17* is configured, and when *highSpeedDeploymentTypeFR2-r17* is configured as bidirectional. This test will partly verify the L1-RSRP measurement requirements for power class 6 UE configured with *highSpeedMeasFlagFR2-r17* for FR2 in clause 9.5.4.1 with the testing configurations for NR cells in Table A.7.6.3.X.1-1.

[The AoA setup for this test is Setup X as defined in clause A.3.15]

Table A.7.6.3.X.1-1: Applicable NR configurations for FR2 SSB based L1-RSRP test for power class 6 UE supporting SimultaneousReceptionFR2HST-r18

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

##### A.7.6.3.X.2 Test parameters

There is one cell in the test, the FR2 PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.7.6.3.X.2-1 and Table A.7.6.3.X.2-2 below.

There are two SSBs configured in Cell 1. In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on two different QCL Type D SSBs simultaneously and report periodically. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured*.*

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

Table A.7.6.3.X.2-1: General test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Config | Unit | Value |
| highSpeedMeasFlagFR2-r17 | 1~2 |  | Set 2 |
| highSpeedDeploymentTypeFR2-r17 | 1~2 |  | bidirectional |
| 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 Reference measurement channel | 1 |  | SR.3.2 TDD |
| 2 | SR.3.3 TDD |
| RMSI CORESET Reference Channel | 1 |  | CR.3.1 TDD |
| 2 | CR.3.2 TDD |
| Dedicated CORESET Reference Channel | 1 |  | CCR.3.1 TDD |
| 2 | CCR.3.7 TDD |
| SSB configuration | 1 |  | SSB.1 FR2 |
|  | 2 |  | SSB.2 FR2 |
| OCNG Patterns | 1~2 |  | OP.1 |
| Initial BWP Configuration | 1~2 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1~2 |  | DLBWP.1.3  ULBWP.1.3 |
| SMTC configuration | 1~2 |  | SMTC.1 |
| TRS Configuration | 1~2 |  | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1~2 |  | TCI.State.2 |
| DRX configuration | 1~2 |  | DRX.3 |
| reportConfigType | 1~2 |  | periodic |
| reportQuantity | 1~2 |  | ssb-Index-RSRP |
| Number of reported RS | 1~2 |  | 2 |
| L1-RSRP reporting period | 1~2 | slot | 320 |
| T1 | 1~2 | s | 5 |
| T2 | 1~2 | s | 3 |
| EPRE ratio of PSS to SSS | 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 19444Hz |
| 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.7.6.3.X.2-2: SSB specific test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|  |  |  | T1 | T2 | T1 | T2 |
| Angle of arrival configuration |  |  | [Setup X according to A.3.15.X] | | | |
| Beam AssumptionNote 4 | 1-2 |  | Rough | | | |
| Note2 | 1~2 | dBm/15kHz | -105 | | | |
| Note2 | 1 | dBm/SSB SCS | -96 | | | |
|  | 2 |  | -93 | | | |
|  | 1~2 | dB | 0 | 0 | -Infinity | 9 |
| SSB\_RP Note3 | 1 | dBm/SSB SCS | -96 | -96 | -Infinity | -87 |
|  | 2 |  | -93 | -93 | -Infinity | -84 |
| Io Note3 | 1 | dBm/95.04MHz | -63.97 | -63.97 | -66.98 | -57.47 |
|  | 2 |  | -63.97 | -63.97 | -66.98 | -57.47 |
|  | 1~2 | dB | 0 | 0 | -Infinity | 9 |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  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 | | | | | | |

##### A.7.6.3.X.3 Test Requirements

The UE shall send L1-RSRP report every 320 slots. No later than [560 ms] plus 320 slots from the beginning of time period T2, UE shall send L1-RSRP report including the results for both SSB#0, SSB#1 while meeting the accuracy requirements defined in clause 10.1.20.1.

[The reported L1-RSRP value shall include the Rx antenna gain of each receive Rx chain 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 5 =============================