**3GPP TSG-WG4 Meeting #111  *R4-2410287***

**Fukuoka, Japan, 20th - 24th May, 2024**

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.133** | **CR** | **Draft** | **rev** | **1** | **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 |  | Radio Access Network | **x** | Core Network |  |

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|  | | | | | | | | | | |
| ***Title:*** | Draft CR to 38.133 on UL Timing and TCI State Switch Test Case for HST FR2 Enhanced | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Nokia | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_HST\_FR2\_enh-Perf | | | | |  | ***Date:*** | | | 2024-05-23 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***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:*** | | It is necessary to test enhaced RRM core requirements (TCI stat switching and UL timing) for PC6 UEs supporting [*highSpeedTCISwitchEnhMAC*-CE-FR2-r18]: WF from RAN4#110-bis [R4-2406412]:  Agreement:  Introduce a new TC with 0 indication from MAC CE. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Introduction a new test cases under section A.7.5.8.3 to test   * TCI state switchign dealy and timing adjustment for PC6 UE supporting [*highSpeedTCISwitchEnhMAC*-CE-FR2-r18] when [*R18 enhanced MAC-CE indication*] is indicated as ‘0’. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | The enhanced Rel-18 requirements for power class 6 UEs are not fully tested. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | A.7.5.8.3 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **x** | Other core specifications | | | |  | | |
| ***affected:*** | | **x** |  | Test specifications | | | | TS 38.533 | | |
| ***(show related CRs)*** | |  | **x** | O&M Specifications | | | |  | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | | Changes are shown on top of the endorced Draft Big CR R4-2406408.  A revision of the R4-2406410 draft CR endroced at RAN4#110-bis.  Revision of R4-2408642. | | | | | | | | |

## <Start of Change>

#### 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 *tci‑StateSwitchInd‑r18* for 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. In the test, *highSpeedMeasFlagFR2-r17* is configured and cross-RRH TCI state indicator for UE-specific PDCCH MAC *CE* as specified in Clause 6.1.3.77 of TS 38.321 [7] is set to ‘0’ for the TCI state switch for FR2 power class 6 UEsupporting *tci‑StateSwitchInd‑r18* capability.

The test scenario comprises of one NR PCell (Cell 1) and the general test parameters are specified 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 specified in Table A.7.5.8.3.2.1-4. During the test, *highSpeedMeasFlagFR2-r17* is configured to be *set2*.

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), and TCI state 0 is indicated 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 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. From the beginning of T2, the SSB corresponding to TCI state 1 is transmitted. 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 cross-RRH TCI state indicator for UE-specific PDCCH *MAC* *CE* set 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\*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 |
| 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 TCI state switch command with cross-RRH TCI state indicator for UE-specific PDCCH MAC CE set to ‘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>