**3GPP TSG-RAN WG4 Meeting #104-e *R4-2213482***

**Online, August 15 – 26, 2022**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **38.133** | **CR** | **2527** | **rev** | **1** | **Current version:** | **17.6.0** |  |
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| *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:*** | CR on maintaining TCI state switching requirements for R17 unified TCI | | | | | | | | | |
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| ***Source to WG:*** | Huawei, HiSilicon | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_FeMIMO-Core | | | | |  | ***Date:*** | | | 2022-08-10 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***Release:*** | | | Rel-17 |
|  | *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-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
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| ***Reason for change:*** | | In R17, the introduction of active DL/UL TCI state switch delay requirements for unified TCI are not properly defined and need to be aligned with RAN1/RAN2 specifictions. Besides, MAC-CE based UL state switch delay requirement is still FFS when PL-RS is SSB in FR2. | | | | | | | | |
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| ***Summary of change:*** | | 1. To update the wording of introduction for active downlink TCI state switch delay for unified TCI. 2. To update the wording of introduction for active uplink TCI state switch delay for unified TCI 3. To define MAC-CE based UL state switch delay requirements when PL-RS is SSB in FR2. | | | | | | | | |
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| ***Consequences if not approved:*** | | The active DL/UL TCI state switch delay requirements for unified TCI are not properly defined. | | | | | | | | |
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| ***Clauses affected:*** | | 8.15.1, 8.16.1, 8.16.3 | | | | | | | | |
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|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | | **X** |  | Test specifications | | | | TS38.533 | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
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| ***This CR's revision history:*** | |  | | | | | | | | |

<Start of Change 1>

8.15.1 Introduction

The requirements in this clause apply for a UE configured with *DLorJoint-TCIState* configurations for DL channels on a serving cell.Further the requirements also apply for all the list of serving cells in *simultaneousU-TCI-UpdateList1, simultaneousU-TCI-UpdateList2, simultaneousU-TCI-UpdateList3, simultaneousU-TCI-UpdateList4* in MR-DC or standalone NR. UE shall complete the switch of active downlink TCI state within the delay defined in this clause.

When the target DL TCI state refers to an additional PCI different from the serving cell PCI in which this DL TCI-State is configured, the requirements in this clause are applicable provided that the cell with the additional PCI is known for a UE. A cell with the additional PCI is known if the following conditions are met

Active BWP of the serving cell and a cell with the additional PCI are the same

Center frequency, SCS and SFN offset of a cell with the additional PCI are as the same as serving cell

During the last 5s before L1-RSRP measurement is configured, the UE has sent a valid L3 measurement report for the cell with the additional PCI

Timing offset between serving cell and the cell with the additional PCI is within CP of the corresponding SCS

Otherwise, the cell with the additional PCI is unknown.

<End of Change 1>

<Start of Change 2>

8.16.1 Introduction

The requirements in this clause apply for a UE configured with *DLorJoint-TCIState* (if unifiedTCI-StateType is indicated as *Joint*) or *UL-TCIState* configurations for UL channels/signals on a serving cell. Further the requirements also apply for all the list of serving cells in *simultaneousU-TCI-UpdateList1, simultaneousU-TCI-UpdateList2, simultaneousU-TCI-UpdateList3, simultaneousU-TCI-UpdateList4* in MR-DC or standalone NR. There is no requirement when the UE is requested to switch to a TCI state with the higher layer parameter *UL-TCIState* associated to SRS. UE shall complete the switch of active uplink TCI state within the delay defined in this clause when the UE is requested to switch to a TCI state with the higher layer parameter *DLorJointTCIState* or *UL-TCIState* associated to a DL RS.

PL-RS may be associated with or included in UL TCI state or joint TCI state. The requirements in this clause shall apply if the following conditions are met:

* PL-RS is identical to source RS in UL TCI state or joint TCI state
* PL-RS and source RS in UL TCI state or joint TCI state are QCL-Type D

When the target UL TCI state refers to an additional PCI different from serving cell PCI in which this UL TCI state is configured, the requirements in this clause are applicable provided that the cell with the additional PCI is known for a UE. A cell with the additional PCI is known if the the following conditions are met

Active BWP of the serving cell and a cell with the additional PCI are the same

Center frequency, SCS and SFN offset of a cell with the additional PCI are as the same as serving cell

During the last 5s before L1-RSRP measurement is configured, the UE has sent a valid L3 measurement report for the cell with the additional PCI

Timing offset between serving cell and the cell with the additional PCI is within CP of the corresponding SCS

The SSB from the cell with the additional PCI remains detectable according to the cell identification requirements specified in clause 9.2

Otherwise, the cell with the additional PCI is unknown.

<End of Change 2>

<Start of Change 3>

8.16.3 MAC-CE based uplink TCI state switch delay

The requirements in this clause shall apply for UL TCI state switch using separate UL TCI state or joint TCI state of unified TCI state switch framework.

In case that source RS in UL TCI state or joint TCI state is associated with a PCI different from that of the serving cell, the requirements in this clause shall apply if the cell with different PCI satisfies the known cell condition defined in 8.16.1. If the known cell condition is not met, longer delay may be expected.

[In case of joint TCI state switch, UE is not expected to transmit on UL before UE completes the DL and UL TCI state switch.]

For separate UL TCI state switch or joint TCI state switch for PUCCH or PUSCH, or semi-persistent/aperiodic/periodic SRS, when *beamCorrespondenceWithoutUL-BeamSweeping* is set to 1, upon receiving PDSCH carrying MAC-CE activation command in slot n on serving cell,

* + - If target TCI state is known,
* The UE shall be able to transmit uplink signal with the target TCI state in the slot n+THARQ + 3ms + NM*\** (Tfirst\_target-PL-RS + 4\*Ttarget\_PL-RS + 2ms).
  + - If target TCI state is unknown,
* The UE shall be able to transmit uplink signal with the target TCI state in the slot n+THARQ + 3ms *+* TL1-RSRP+ Tfirst\_target-PL-RS + 4\*Ttarget\_PL-RS + 2ms.

Where,

- THARQ is the timing between DL data transmission and acknowledgement as specified in TS 38.213 [3].

- NM = 1, if the target PL-RS is not maintained by the UE, 0 otherwise.

- Tfirst\_target-PL-RS is time to first pathloss RS transmission after L1-RSRP measurement when target TCI state is unknown.

- Tfirst\_target-PL-RS is time to first pathloss RS transmission after MAC CE command is decoded by the UE for known TCI State.

- Ttarget\_PL-RS is the periodicity of the target pathloss reference signal which would be SSB or NZP CSI-RS when PL-RS is associated with serving cell

- Ttarget\_PL-RS is the periodicity of the target pathloss reference signal which would be SSB when PL-RS is associated with PCI different from serving cell

- T L1-RSRP is the time for Rx beam refinement in FR2, defined as

- TL1-RSPR\_Measurement\_Period\_SSB for SSB as specified in clause 9.5.4.1,

- with the assumption of M=1

- with TReport = 0

- TL1-RSRP\_Measurement\_Period\_CSI-RS for CSI-RS as specified in clause 9.5.4.2

- CSI-RS based L1-RSRP measurement only apply for TCI state switch when source RS is associated with serving cell

- configured with higher layer parameter *repetition* set to ON

- with the assumption of M=1 for periodic CSI-RS

- for aperiodic CSI-RS if number of resources in resource set at least equal to *MaxNumberRxBeam*

- with TReport = 0

Editor note: when PL-RS is SSB in FR2, the delay requirement is FFS.

<End of Change 3>