**3GPP TSG-RAN WG2 Meeting #121 R2-230xxxxx**

**Athens, Greece, 27th February – 3rd March, 2023**

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
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|  | **38.331** | **CR** | **xxxx** | **rev** | **-** | **Current version:** | **17.3.0** |  |
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| *For* [***HELP***](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 | **x** | Core Network |  |

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| ***Title:***  | Corrections on the unified TCI-state configuration for cross cell referencing |
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| ***Source to WG:*** | Ericsson |
| ***Source to TSG:*** | R2 |
|  |  |
| ***Work item code:*** | NR\_feMIMO-Core |  | ***Date:*** | 2023-03-03 |
|  |  |  |  |  |
| ***Category:*** |  |  | ***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 canbe 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:*** | IE TCI-State and IE TCI-UL-State configure UE with fields ul-powerControl-r17 and pathlossReferenceRS-Id-r17. The ul-powerControl-r17 refers to a list element configured in IE ServingCellConfig. The pathlossReferenceRS-Id-r17 refers to a list configured in IE BWP-UplinkDedicated.When a field *cell* in IE TCI state, or *servinCellId* in IE TCI-UL-State are configured, it is unclear in which cell *ul-powerControl-r17* is defined or in which cell and BWP *pathlossReferenceRS-Id-r17* is defined.  |
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| ***Summary of change:*** | 1. Addition of UL BWP field for pathloss reference RS in both IE TCI-State and IE TCI-UL-State
2. Addition of field description for *ul-powerControl-r17* and *pathlossReferenceRS-Id-r17* in IE TCI-State and IE TCI-UL-State

**Impact Analysis**Impacted 5G architecture options: NR SA, (NG)EN-DC, NE-DC,NR-DC Impacted functionality: Unified TCI state frameworkInter-operability:1. If the network is implemented according to the CR and the UE is not, cross cell referencing for unified TCI state does not work.2. If the UE is implemented according to the CR and the network is not, cross cell referencing for unified TCI state does not work. |
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| ***Consequences if not approved:*** | Cross cell referencing for unified TCI state does not work. |
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| ***Clauses affected:*** |  6.3.2 |
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|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ... |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
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| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

*START OF CHANGE*

### 6.3.2 Radio resource control information elements

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#### – *TCI-State*

The IE *TCI-State* associates one or two DL reference signals with a corresponding quasi-colocation (QCL) type.

*TCI-State* information element

-- ASN1START

-- TAG-TCI-STATE-START

TCI-State ::= SEQUENCE {

 tci-StateId TCI-StateId,

 qcl-Type1 QCL-Info,

 qcl-Type2 QCL-Info OPTIONAL, -- Need R

 ...,

 [[

 additionalPCI-r17 AdditionalPCIIndex-r17 OPTIONAL, -- Need R

 pathlossReferenceRS-Id-r17 PathlossReferenceRS-Id-r17 OPTIONAL, -- Cond JointTCI1

 ul-powerControl-r17 Uplink-powerControlId-r17 OPTIONAL -- Cond JointTCI

 ]],

 [[

 pl-RS-UL-BWP-Id-r17 BWP-Id OPTIONAL -- Cond PLRefCell

 ]]

}

QCL-Info ::= SEQUENCE {

 cell ServCellIndex OPTIONAL, -- Need R

 bwp-Id BWP-Id OPTIONAL, -- Cond CSI-RS-Indicated

 referenceSignal CHOICE {

 csi-rs NZP-CSI-RS-ResourceId,

 ssb SSB-Index

 },

 qcl-Type ENUMERATED {typeA, typeB, typeC, typeD},

 ...

}

-- TAG-TCI-STATE-STOP

-- ASN1STOP

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| *QCL-Info* field descriptions |
| ***bwp-Id***The DL BWP which the RS is located in. |
| ***cell***The UE's serving cell in which the *referenceSignal* is configured. If the field is absent, it applies to the serving cell in which the *TCI-State* is applied by the UE. The RS can be located on a serving cell other than the serving cell for which the *TCI-State* is applied by the UE only if the *qcl-Type* is configured as *typeC* or *typeD*. See TS 38.214 [19] clause 5.1.5. |
| ***referenceSignal***Reference signal with which quasi-collocation information is provided as specified in TS 38.214 [19] clause 5.1.5. |
| ***qcl-Type***QCL type as specified in TS 38.214 [19] clause 5.1.5. |

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| *TCI-State* field descriptions |
| ***additionalPCI***Indicates the physical cell IDs (PCI) of the SSBs when *referenceSignal* is configured as SSB for both QCL-Type1 and QCL-Type2. In case the c*ell* is present, the *additionalPCI* refers to a PCI value configured in the list configured using *additionalPCI-ToAddModList* in the serving cell indicated by the field c*ell*. Otherwise, it refers to a PCI value configured in a list *additionalPCI-ToAddModList* configured in the serving cell where the *TCI-State* is applied by the UE. When this field is present the *cell* for *qcl-Type1* and *qcl-Type2* is configured with same value, if present. |
| ***pathlossReferenceRS-Id***The ID of the reference signal (e.g. a CSI-RS or an SS block) used for PUSCH, PUCCH and SRS path loss estimation. In case the *cell* is present, the *pathlossReferenceRS-Id* refers to an element in the list configured using *pathlossReferenceRSToAddModList* in the serving cell indicated by the field *cell* and in the uplink bandwidth part indicated by *pl-RS-UL-BWP-Id*. Otherwise, it refers an element in the list configured using *pathlossReferenceRSToAddModList* in the serving cell where the *ul-TCI-StateList* is applied by the UE. |
| ***qcl-Type1, qcl-Type2***QCL information for the TCI state as specified in TS 38.214 [19] clause 5.1.5. |
| ***tci-StateId***ID number of the TCI state. |
| ***ul-PowerControl***Configures power control parameters for PUCCH, PUSCH and SRS for this TCI state. The field is present here only if *ul-powerControl* is not configured in any *BWP-Uplink-Dedicated* of this serving cell. In case the *servingCellId* is present, the *ul-powerControl* refers to an element in the list configured using *uplink-PowerControlToAddModList* in the serving cell indicated by the field *cell* Otherwise, it refers to an element in the list configured using *uplink-PowerControlToAddModList* in the serving cell where the *ul-TCI-StateList* is applied by the UE. |

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| Conditional Presence | Explanation |
| *CSI-RS-Indicated* | This field is mandatory present if *csi-rs* is included, absent otherwise |
| *JointTCI* | This field is optionally present, Need R,if this serving cell is configured with *unifiedTCI-StateType* set to '*joint*'. It is absent, Need R, otherwise. |
| *JointTCI1* | This field is mandatory present, if this serving cell is configured with unifiedTCI-StateType set to 'joint'. It is absent, Need R, otherwise. |
| *PLRefCell* | This field is mandatory present if *pathlossReferenceRS-Id* is present and cell is present. It is absent, Need R, otherwise. |

*NEXT CHANGE*

#### – *TCI-UL-State*

The IE *TCI-UL-State* indicates the TCI state information for UL transmission.

*TCI-UL-State* information element

-- ASN1START

-- TAG-TCI-UL-STATE-START

TCI-UL-State-r17 ::= SEQUENCE {

 tci-UL-State-Id-r17 TCI-UL-State-Id-r17,

 servingCellId-r17 ServCellIndex OPTIONAL, -- Need R

 bwp-Id-r17 BWP-Id OPTIONAL, -- Cond CSI-RSorSRS-Indicated

 referenceSignal-r17 CHOICE {

 ssb-Index-r17 SSB-Index,

 csi-RS-Index-r17 NZP-CSI-RS-ResourceId,

 srs-r17 SRS-ResourceId

 },

 additionalPCI-r17 AdditionalPCIIndex-r17 OPTIONAL, -- Need R

 ul-powerControl-r17 Uplink-powerControlId-r17 OPTIONAL, -- Need R

 pathlossReferenceRS-Id-r17 PathlossReferenceRS-Id-r17 OPTIONAL, -- Cond Mandatory

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 pl-RS-UL-BWP-Id-r17 BWP-Id OPTIONAL -- Cond PLRefCell

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}

-- TAG-TCI-UL-STATE-STOP

-- ASN1STOP

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| *TCI-UL-State* field descriptions |
| ***additionalPCI***Indicates the physical cell IDs (PCI) of the SSBs when *referenceSignal* is configured as SSB. In case the *servingCellId* is present, the *additionalPCI* refers to a PCI value configured in the list configured using *additionalPCI-ToAddModList* in the serving cell indicated by the field *servingCellId*. Otherwise, it refers to a PCI value configured in the list configured using *additionalPCI-ToAddModList* in the serving cell where the *ul-TCI-StateList* is applied by the UE. |
| ***bwp-Id***The DL BWP which the CSI-RS is located in or UL BWP where the SRS is located in. |
| ***servingCellId***The UE's serving cell in which the *referenceSignal* is configured. If the field is absent, it applies to the serving cell in which the *TCI-UL-State* is applied by the UE. |
| ***pathlossReferenceRS-Id***The ID of the reference Signal (e.g. a CSI-RS or a SS block) used for PUSCH, PUCCH and SRS path loss estimation. In case the *servingCellId* is present, the *pathlossReferenceRS-Id* refers to an element in the list configured using *pathlossReferenceRSToAddModList* in the serving cell indicated by the field *servingCellId* and in the uplink bandwidth part indicated by *pl-RS-UL-BWP-Id*. Otherwise, it refers an element in the list configured using *pathlossReferenceRSToAddModList* in the serving cell where the *ul-TCI-StateList* is applied by the UE. |
| ***ul-powerControl***Configures power control parameters for PUCCH, PUSCH and SRS for this TCI state. The field is present here only if *ul-powerControl* is not configured in any *BWP-Uplink-Dedicated* of this serving cell. In case the *servingCellId* is present, the *ul-powerControl* refers to an element in the list configured using *uplink-PowerControlToAddModList* in the serving cell indicated by the field *servingCellId*. Otherwise, it refers to an element in the list configured using *uplink-PowerControlToAddModList* in the serving cell where the *ul-TCI-StateList* is applied by the UE. |

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| Conditional Presence | Explanation |
| *CSI-RSorSRS-Indicated* | This field is mandatory present if *referenceSignal* is set to *csi-RS-index* or to *srs*, absent otherwise |
| *Mandatory* | The field is mandatory present. |
| *PLRefCell* | This field is mandatory present if pathlossReferenceRS-Id is present and cell is present. It is absent, Need R, otherwise. |

*END OF CHANGE*