**3GPP TSG-RAN WG2 Meeting #119R2-2208963**

**Electronic August 2022**

**Title: DRAFT**LS on further questions on feMIMO RRC parameters

**Response to: -**

**Release:** Rel-17

**Work Item:** NR\_feMIMO-Core

**Source:** ERICSSON to be replaced by 3GPP TSG-RAN WG2

**To:** 3GPP TSG-RAN WG1

**Contact Person:**

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**Attachments:** None

1. **Overall Description:**

**DL or joint TCI state configuration**

RAN2 discussed the field description of *additionalPCI* in *TCI-state* (for Rel-17 joint or DL TCI states) and *cell* in *QCL-Info* in *TCI-State*

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 PUSCH-PathlossReferenceRS-Id OPTIONAL, -- Cond JointTCI

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

 ]]

}

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},

 ...

}

The current definition of TCI-state in the RRC specification is so that for each TCI-state, single *additionalPCI* and two qcl-Types (i.e., *qcl-Type*1 and *qcl-Type2*) may be configured. For a qcl-Type, parameters such as *cell*, *referenceSignal,* etc., are configured.

The current field descriptions states:

***additionalPCI***

Indicates that this TCI state refers to an additional PCI different from serving cell PCI, as configured in *ServingCellConfig*.

***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 configured. The RS can be located on a serving cell other than the serving cell in which the *TCI-State* is configured only if the *qcl-Type* is configured as *typeC* or *typeD*. See TS 38.214 [19] clause 5.1.5.

**Question 1**

RAN2 would like to ask RAN1

1. RAN2 assumes *additionalPCI* is per TCI-state and refers to the configured reference signal in case of SSB. That is, there is no such case where *qcl-Type1* and *qcl-Type2* for the same TCI-state associate with different *additionalPCI* values. Note that *additionalPCI* is an index referring to a PCI value configured in a list *additionalPCI-ToAddModList* under a serving cell configuration and thus depending which serving cell I understood, the exact PCI value may be different. Please confirm whether this is also RAN1’s understanding.
2. if a) is confirmed, would there be need to state that *cell* cannot be two different values for *qcl-Type1* and *qcl-Type2*?

**Question 2**

RAN2 considers the case where a serving cell uses the TCI states defined in another cell, i.e. *dl-OrJoint-TCIStateList* is set to *unifiedTCI-StateRef*. and would like to ask RAN1:

1. When “cell” is absent in QCL-info, is the *referenceSigna*l located in the serving cell where the *TCI-state* is configured (*dl-orJoint-TCI-State-ToAddModList* is in IE *PDSCH-Config* of this serving cell) or in the serving cell where the *TCI-state* is used ( *unifiedTCI-StateRef* is in IE *PDSCH-Config* of this serving cell)? And is the above limited to certain qcl-Type?
2. Is the configuration of the TCI state of the serving cell indicated by *unifiedTCI-StateRef* still applicable for the serving cell configured with *unifiedTCI-StateRef* when the serving cell (e.g. SCell) indicated by *unifiedTCI-StateRef* is deactivated?

**UL TCI state configuration**

RAN2 also discussed the IE *TCI-UL-State* with respect to the need to update field descriptions of *additionalPCI* or the *servingCellId* or *ul-powerControl*

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 PUSCH-PathlossReferenceRS-Id-r17 OPTIONAL, -- Need R

 ...

}

***additionalPCI***

Indicates the physical cell IDs (PCI) of the SSBs.

***servingCellId***

The UE's serving cell in which the *referenceSignal-r17* is configured. If the field is absent, it applies to the serving cell in which the *TCI-UL-State* is configured. The RS can be located on a serving cell other than the serving cell in which the *TCI-State* is configured only if the *qcl-Type* is configured as *typeC* or *typeD*. See TS 38.214 [19] clause 5.1.5.

***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.

**Question 3**

RAN2 would like to ask RAN1

1. in case the *servingCellId* is present, does the *additionalPCI* in IE *TCI-UL-State* refer to one of additional PCIs configured in the serving cell indicated by the field *servingCellId*?
2. is it correct that there is no *qcl-Type* field in IE *TCI-UL-State* as the parameter list excel file in R1-2202759 did not advice to include QCL Type for UL TCI state(row4)?
3. If b) is correct, it is assumed that QCL related limitations should be deleted from the field description of the *servingCellId*? That is, should. "The RS can be located on a serving cell other than the serving cell in which the *TCI-State* is configured only if the *qcl-Type* is configured as *typeC* or *typeD*. See TS 38.214 [19] clause 5.1.5." in the field description of *servingCellId*" be deleted?

**Question 4**

RAN2 considers the case where a serving cell uses the UL TCI states defined in another cell, i.e. *ul-TCIStateList* is set to *unifiedTCI-StateRef*. and would like to ask RAN1:

1. When ‘*servingCellId*’ is absent in TCI-UL-State, is the *referenceSignal* configured in the serving cell where the *TCI-UL-state* is configured or in the serving cell where the *TCI-ULstate* is used (in case this serving cell is not directly configured with UL TCI states but is configured with parameter *unifiedTCI-StateRef* )?

**UL power control**

RAN2 also discussed about the configuration flexibility of the UL power control.

In Rel-17 unified TCI framework, *TCI-State* (joint type) and *TCI-UL-State-r17* (UL-only type) can be optionally configured with a set of power control parameters (*ul-powerControl-r17*). According to TS 38.331 V17.1.0, there are two possible configuration cases: a) *ul-powerControl-r17* is present in *BWP-UplinkDedicated* and it is absent in all joint TCI states used together with this *BWP-UplinkDedicated* and UL TCI states used in this *BWP-UplinkDedicated*, b) *ul-powerControl-r17* is absent in *BWP-UplinkDedicated* and it is present in all joint TCI states used together with this *BWP-UplinkDedicated* and UL TCI states used together with this BWP.

RAN1’s agreements do not exclude the case that *ul-powerControl-r17* is present in some TCI states and is absent in other TCI states (case c)). In case c), *ul-powerControl-r17* can be configured in both *BWP-UplinkDedicated* and joint *TCI-State*/*TCI-UL-State-r17* and the UE uses *ul-powerControl-r17* in *BWP-UplinkDedicated* only when the TCI state used is not configured with *ul-powerControl-r17*. However, this case is currently excluded by RAN2 specifications

**Question 5**

RAN2 would like to ask RAN1 whether current specification is sufficient for UL power control or whether further flexibility, such as case c), should be supported

**PH reporting**

In TS 38.321 v17.1.0, the UE reports two Type 1 PH values or (one) Type 3 PH value for a serving cell if the serving cell is configured with mTRP PUSCH repetition and the MAC entity to which this serving cell belongs is configured with *twoPHRMode*. However, there are diverging understandings in RAN2 on this, so RAN2 would like to ask RAN1:

**Question 6**

1. Does the UE RAN2 have correct understanding for PH report?
	1. the UE provides two Type 1 PH value for the serving cell if there is actual or reference PUSCH transmission on both TRP in slot n.
	2. the UE provides one Type 3 PH value for the serving cell if there is actual or reference SRS transmission in slot n.
2. If a) is correct, in which case will the UE report type 3 PH value for this serving cell?

**2. Actions:**

**To RAN1 group:**

**ACTION:** RAN2 respectfully asks RAN1 to provide responses to above questions.

**3. Date of Next TSG-RAN WG2 Meetings:**

TSG-RAN WG2 Meeting #119-e October 2022 Electronic

TSG-RAN WG2 Meeting #120 November 2022 Europe