**3GPP TSG-RAN WG2 Meeting #116bisR2-2xxxxx**

**Electronic January 2022**

**Title: DRAFT**LS 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

**Cc:** RAN3, RAN4

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**Attachments:** None

**1. Overall Description:**

RAN2 has been discussing several L1 parameter related open issues left to RAN2 as well as overall the implementation of all L1 feMIMO RRC parameters. RAN2 would like feedback from RAN1 about the following aspects.

**1. MultiBeam**

**CORESET** **to follow Unified TCI state**

RAN2 has discussed the per CORESET RRC based indication based on RAN1 agreements.

* + *For any PDCCH reception on a ‘CORESET B’ and the respective PDSCH reception, whether or not UE to apply the indicated Rel-17 TCI state associated with the serving cell is determined per CORESET by RRC*

RAN2 understands that the 1 bit RRC indication “*followUnifiedTCI-State*” would be needed for CORESET type “B”. RAN2 understanding is that it seems to indicate how the TCI states behave depending on the type (i.e. CSS or USS) of the SearchSpace that uses the CORESET. However, as in RRC there is no types of CORESETs RAN2 would like to ask RAN1 to clarify the intention of the indication in more details.

***Question 1.1:*** What is the intent behind this indication and why was it put to CORESET?

Question 1.2: Are there any limitation or conditions needs to specified for the "*followUnifiedTCI-State*" parameter? For example, since UE may not be able to receive from pTRP and aTRP at the same time, does that mean that the SearchSpaces that follow different TRPs need to be restricted so that their SearchSpaces are not overlapping?

***Question 1.3*** How are the “DM-RS for non-UE dedicated PDCCH” in parameter "*applyTCI-State-DL-List-r17"* and the CORESET “*followUnifiedTCI-State*” related?

**Parameter *applyTCI-StateDL-List-r17***

RAN2 notes there is discrepancy with the description and comment related to *applyTCI-State-DL-List-r17*. RAN2 has baseline implementation for this functionality where 1 bit “followUnifiedTCI-State" indication is added to “AssociatedReportConfigInfo” IE where QCL for an aperiodic resource is currently configured.

**Question 1.4** Is this RRC parameter implementation is according to intended functionality or should the indication be placed per NZP-CSI-RS resource?

Note that it will be RAN2 signalling design whether supporting this functionality is 1 bit indication per field X, or by maintaining lists of field X.

**Parameter ApplyTCI-State-r17forSRS** RAN2 intends to add the parameter “*followUnifiedTCI-State-r17*” (*ApplyTCI-State-r17forSRS* in RAN1 RRC parameter list) to *SRS-ResourceSet* IE according to RAN1 guidance.

**Question 1.5** Are the stated restrictions indicated in the L1 parameter excel (i.e. “This applies to the following: 1) Aperiodic SRS for BM, 2) SRS (of any time-domain behavior) for codebook, non-codebook, and antenna switching “) should be placed in TS 38.331 or these will be specified by RAN1? If they should be specified in RAN2, are there any additional restrictions that have not yet been communicated?

**MPE**

In RAN2#116, RAN2 agreed the following

*4: Rel-17 MPE configuration can be included in PHR-Config. Will ask R1 whether MPE information can apply to both ICBM and mTRP*

This will impact at least the corresponding MAC CE design but potentially also configuration. Further, the parameter excel has TBD on the range for configuring the MPE resource pool. , which will be configured by RRC but for which RAN1 has not yet indicated maximum number RAN2 would need to know this to derive the number of bits needed for the resource IDs in the MPE resource pool.

**6**Please clarify the structure of the *mpe*: Is it (i.e. SSBRI or CRI), and sconfigured

RAN2 was also not clear on whether the MPE reporting would apply for the mTRP PHR and whether the same configuration as for ICBM could be used with mTRP to activate the reporting, so RAN2 would like RAN1 to clarify this.

**Question 1.7** Does the enhanced MPE reporting applies also to mTRP operation, and, if it does, will this be activated by RRC signaling (e.g. using the same configuration as used for the ICBM case)?

Additionally, RAN2 has currently considered to include the MPE resource pool configuration inside *PHR-Config* IE, which is part of *MAC-CellGroupConfig* IE, which is per cell group. This is because the existing Rel-16 MPE reporting was defined as part of *PHR-Config*. This assumes that the MPE resource pool can be defined over all cells in the cell group. The L1 parameter excel from RAN1 indicated this to be per BWP instead, so RAN2 would like to understand if this is the correct placement.

**Question 1.7** RAN1 to confirm whether the RAN2 should decide about including the MPE resource pool parameters between in the PHR-Config IE, which is per cell group, and (per-cell) per BWP as indicated in L1 parameter excel?

**2. mTRP (PUCCH, PDCCH PHR)**

For mTRP PUCCH, RAN2 has agreed to add a new IE for power control for mTRP FR1 operation. However, RAN2 would need information on the number of power control sets to be configured.

**Question 2.1** How many power control sets needs to be configured per UE/cell/BWP?

For mTRP PDCCH, RAN1 indicates that parameter *searchSpaceLinking* is suppposed to link two SearchSpace sets by RRC configuration with various limitations. However, it was not clarified whether the linking should be applied eSearchSpaces of Rel-15 and Rel-16.

**Question 2.2** Should the *searchSpaceLinking* be applied SearchSpaces of Rel-15 and Rel-16?

**4. CSI mTRP** For mTRP CSI, RAN2 was instructed to configure two codebook subset restrictions (CBSRs) per CodebookConfig, and two RI restrictions per CodebookConfig. However, it is not clear which CBSRs are intended to be used and whether there are specific restrictions to be applied for the RRC configuration.

**Question 2.3** Which CBSRs are intended to be used and whether there are specific restrictions to be applied for the RRC configuration?

For mTRP PHR reporting, RAN2 is considering creating a new MAC CE format that indicates the PHR for both TRPs. However, it was not clear how the "TRP identity" should be reflected in the MAC CE - is this based on CORESET pool id or SRS-ResourceSet ID or something else?

**Question 2.4** How is the "TRP identity" defined for the mTRP PHR reporting - is it based on CORESET pool id, SRS-ResourceSet ID, or something else?

**3. SRS**

RAN2 also noted that the parameter startPosition was not included in the indicate Rel-17 reousrceMapping for SRS, but it was not clear if this was intentionally or accidentally omitted from the Rel-17 SRS configuration.

**Question 3.1** Should the parameter startPosition should be included in resourceMapping also for Rel-17 (similarly as it was there in Rel15 and Rel 16 configurations)?

**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 WG1 Meeting #117-e 21 February - 3 March 2022 Electronic

ASN1 review April 2022 Electronic

TSG-RAN WG1 Meeting #118-e 16 – 27 May 2022 Electronic