**3GPP TSG RAN WG2 NR ASN.1 Ad-hoc electronic R2-220xxxx**

**e-Meeting, April 20th – 22nd, 2022**

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

**Response to: -**

**Release:** Rel-17

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

**Source:** Ericsson, Intel [to be RAN2]

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

**Contact Person:**

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**Attachments:** None

**1. Overall Description:**

During ASN.1 review, RAN2 identified some questions that needs RAN1 inputs as follows.

**Issue 1 : Pathloss Reference RS for BM and PUCCH mTRP (RIL: E016, Editor’s note in Rel-17 TS 38.331)**

pathlossReferenceRS-Id-r17 was used originally for DLorJoint-TCIState-r17 and PUCCH-PowerControlSetInfo-r17 separately but changed to PUCCH-PathlossReferenceRS-Id/PUSCH-PathlossReferenceRS-Id due to RRC consistency issues. In order to finalize these parameters, it is necessary to know what the maximum number of pathloss Reference RSs is for BM and PUCCH mTRP respectively. In particular, for the unified TCI state, RAN1 agreement "Total of maintained PL-RS per CC is up to 4" is not clear: Does this refer to the maximum amount of configured PL-RS per serving cell? Or what does “maintained” mean in context of RRC configuration?

**Question 1:** What does the RAN1 "Total of maintained PL-RS per CC is up to 4" mean for signalling of PL-RS? Is it the maximum number of configured Pathloss RS set for 1) unified TCI state and 2) PUCCH power control set, or something else?

**Issue 2: sfnScheme-r17 and sfnSchemePdsch-r17 in HST (RILS: V107, V108, I113, E011)**

RAN1 indicates sfnScheme-r17 and sfnSchemePdsch-r17 as per BWP. However, there is a note that “In Rel-17, all downlink BWPs (except initial BWP and FFS: BWP-DownlinkCommon) within a CC should have the same configuration of SFN scheme”. In addition, it is not clear whether PDSCH and PDCCH can have different SFN schemes in the same serving cell?

**Question 2:** RAN2 has currently defined sfnScheme-r17 as part of PDCCH-Config and sfnSchemePdsch-r17 as part of PDSCH-Config, which are per BWP. But since the values are the same for all BWPs, a more efficient signalling would be to define them per serving cell. Is there a reason why the configuration needs to be per BWP?

**Question 3:** Can PDSCH and PDCCH use different SFN schemes in the same serving cell, e.g. can PDCCH use sfnSchemeA and PDSCH sfnSchemeB for the same BWP?

**Issue 3: CSI-mTRP (RILS: V109, V111, V110, I104, M361)**

RAN2 introduced 2 types of RI restrictions and two codebook subset restrictions (CBRS) per CodebookConfig. However, it is not clear how those features are enabled: Currently, same as in previousl releases, RAN2 signalling assumes both RI restrictions and CBRS are configured simultaneously, but RAN2 would like to verify this is the correct assumption for the signallling.

**Question 4:** Which of the following assumptions are correct?

* Two RI restrictions and two CBSRs are always configured simultaneously (i.e. either both are configured or neither is configured).
* UE can be configured with either RI restriction for sTRP or RI restriction for NCJT, but not both at the same time.
* Two CBSRs are only configured together whenever two CMR groups are configured, i.e. configuring two CBSRs also requires configuration of two CRM groups .

**Issue 4:**

There are several parameters to support mTRP PUSCH (i.e. PUSCH repetition). RAN2 configuration assumes those parameters are only configured when two SRS resource sets are configured and the *SRS-Config::usage* is set to *codebook* or *noncodebook*. However, it is not clear the what "two SRS resource sets" means since the Rel-15/16 SRS resource sets can configure up to 16 and there two types of SRS resource sets for DCI format 0\_1 and 0\_2 separately. RAN2 would need to know this to set the configuration constraints correctly.

    srs-ResourceSetToAddModList             SEQUENCE (SIZE(1..maxNrofSRS-ResourceSets)) OF SRS-ResourceSet                  OPTIONAL,   -- Need N

    srs-ResourceSetToAddModListDCI-0-2-r16  SEQUENCE (SIZE(1..maxNrofSRS-ResourceSets)) OF SRS-ResourceSet          OPTIONAL, -- Need N

**Question 5:** When mTRP PUSCH repetition is used, what is the requirement for "two SRS resource sets" being used? Can those be also Rel-15/16 SRS resource sets, or do they only relate to Rel-17 fields?

**Issue 5: (RIL E008)**

The Rel-17 parameter *ul-powerControl-r17* configures power control parameters for PUCCH, PUSCH and SRS when UE is configured with unified TCI state. Current RRC enables the configuration in a dedicated UL BWP and also in configured unified TCI state that contains UL (i.e. joint or UL TCI state). Hence the current field description states:

***ul-powerControl***

Configures power control parameters for PUCCH, PUSCH and SRS when UE is configured with unifiedtci-StateType .The field is present here only if UL power control is not configured for any UL TCI state and DLorJoint-TCIState.

However, as it is understood that UE can be configured only with unified TCI state or Rel-15/16 TCI state framework, it is not clear if can be configured with Rel-15/16 power control parameters when UE is configured with parameter *ul-powerControl-r17*.

**Question 6:** Is UE always configured with parameter *ul-powerControl-r17* when UE is configured with unified TCI state? If yes, should the configuration indicate that the Rel-15/16 UL power control configuration is not configured when unified TCI state is configured?

**Issue 6: MPE reporting in ICBM (inter-cell beam management):**

RAN2 has currently defined MPE resource pool as only using serving cell SSB/CSI-RS indexes. However, it was not clear if the MPE resource pool should also allow indicating SSB/CSI-RS indexes for the additional PCI so RAN2 would like to verify that.

**Question 7:** In one MPE resource pool, can a MPE resource containing SSBRI/CRI associated with additional PCI?

**Issue 7: Max values FFS in Rel-17 TS 38.331**

Some maximum values are still missing from RRC configuration and RAN2 needs those for ASN.1 freezing.

**Question 8:** Please provide value for maxNrofCandidateBeams-r17 and maxNrofBFDResourcePerSet-r17.

**Issue 8: Possibilities for BFD-RS configuration (RIL: I109)**

The existing RRC signalling for BFD-RS configuration allows the following possibilities:

* Possibility 1: Two explicit BFD-RS set: e.g. failureDetectionSet1-r17 and failureDetectionSet2-r17 with respective bfdRSSetId-r17
* Possibility 2: One explicit BFD-RS set ONLY: e.g. failureDetectionSet1-r17 or failureDetectionSet2-r17 with bfdRSSetId-r17. It requires that the UE determines BFD-RS for the other BFD-RS set, e.g. according to TCI state(s) for PDCCH reception and the corresponding coreset pool index.
* Possibility 3: BFD-RS without explicit BFD-RS set: e.g. failureDetectionSet1-r17 or failureDetectionSet2-r17 without bfdRSSetId-r17. It requires that the UE determines the BFD-RS which each BFD-RS belongs to.

In our understanding, Possibility 2 and Possibility 3 cannot be supported by the exiting RAN1 specifications.

Question 9: Please confirm that Possibility 2 and Possibility 3 cannot be supported by the exiting RAN1 specifications, and RRC signalling for BFD-RS configuration should exclude Possibility 2 and Possibility 3.

**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 #118-e 16 – 27 May 2022 Electronic

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