**3GPP TSG-RAN WG2 Meeting #123bisR2-22110xx**

**Xiamen, P.R. China, 9-13 October 2023**

**Title:** DRAFT LS on MIMOevo

**Release:** Rel-18

**Work Item:** NR\_MIMO\_evo\_DL\_UL-Core

**Source:** Ericsson (to be replaced with 3GPP TSG-RAN WG2)

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

**Contact Person:**

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**Attachments:** None

RAN2 has discussed the MIMOevo RRC parameters and is maintaining running RRC CR with latest version noted in R2-2310611. RAN2 has thus far identified the following questions to RAN1:

1. Field applyIndicatedTCI-State in IE CSI-AssociatedReportConfigInfo

In RAN2 current understanding, the field applyIndicatedTCI-State may be configured per resource of per resource set, in which case each resource in a resource set may have different value for the field.

 applyIndicatedTCI-State-r18 CHOICE {

 perset-r18 ENUMERATED {first, second}

 perresource-r18 SEQUENCE (SIZE(1..maxNrofAP-CSI-RS-ResourcesPerSet)) OF ENUMERATED {first, second}

 }

Question 1a RAN2 would like to confirm if this is the correct understanding?

In IE CSI-AssociatedReportConfigInfo, the resourcesForChannel2 was restricted not to be used with unified TCI state. However, RAN2 assumes in Release-18 field resourcesForChannel2 is enabled with unified TCI state.

Question 1b RAN2 would like to confirm if the above is the correct understanding?

Question 1c If answer to Q1b is yes, RAN2 would like to further ask, whether the parameter applies to both resourcesForChannel and resourcesForChannel2 and whether same value/values are used or these should have separate configurations?

1. Simultaneous TCI state update/common TCI state update

In Release-17, there is feature for simultaneous unified TCI state update (based on simultaneousU-TCI-UpdateListx-r17).

Question 2a: RAN2 would like to ask if this would apply also for Release-18 unified TCI state extension for mTRP? That is, whether the simultaneousU-TCI-UpdateListx-r17 is expected to apply to new Rel-18 MAC CEs?

Question 2b: Is there any restrictions in configuring the serving cells of one list for sDCI mTRP, mDCI mTRP or sTRP operation?

Question 2c: Is it correct understanding that the Rel-18 simultaneous TCI state update applies to both DL-only/Joint TCI state and ul-TCIState?

1. Reference CC/BWP for TCI state list configurations

The reference CC/BWP includes the Rel-17 TCI state pool (a list of TCI states) for PDSCH/PDCCH/PUSCH/PUCCH. This is understood as signalling optimization for UL/DL or joint TCI state list configuration when UE is configured with unified TCI state operation.

Question 3a: RAN2 would like to ask if this optimization of using reference CC/BWP should be applied to Release-18 features and if so which?

Question 3b: If the response to Q3a is yes for 2TA operation for mDCI mTRP, RAN2 would like to ask how the tag\_id\_ptr per TCI state configuration should be understood here. whether the tag\_id\_ptr in the TCI state refers to the TAG of the serving cell where the TCI state is configured or to the TAG of the serving cell where the TCI state is applied?

1. Field n1-n2-codebookSubsetRestrictionList-R18(CJT) and n1-n2-codebookSubsetRestriction-r18(Doppler) in IE CodebookConfig

Furthermore, for both CJT and CJT-PS codebooks, RAN1 indicates in the RRC parameter list [3] and in LS R1-2308396 that only hard amplitude restriction is supported (i.e., no soft amplitude restriction). Note that this restriction has been capture in TS 38.214 clause 5.2.2.2.8 and 5.2.2.2.10 in the CR R1-2308716.

|  |
| --- |
| The bitmap parameter *n1-n2-codebookSubsetRestriction-CJT-r18* is configured per CSI-RS resource and for at least one of the $N\_{TRP}$ CSI-RS resources, and it is configured as described in Clause 5.2.2.2.5, where only the bit values ‘00’ or ‘11’ of Table 5.2.2.2.5-6 are configurable. If parameter *n1-n2-codebookSubsetRestriction-CJT-r18* is not configured for a CSI-RS resource, no restriction is applied to the selection of vectors $v\_{m\_{1,j}^{\left(i\right)},m\_{2,j}^{(i)}}$ corresponding to that resource.The bitmap parameter *n1-n2-codebookSubsetRestriction-Doppler-r18* is configured as described in Clause 5.2.2.2.5, where only the bit values ‘00’ or ‘11’ of Table 5.2.2.2.5-6 are configurable. |

RAN2 understanding is that the following savings could be possible in IE CBSR-r18 which is used to configure values for Field n1-n2-codebookSubsetRestrictionList-R18(CJT) and n1-n2-codebookSubsetRestriction-r18(Doppler).

For example, for $N\_{1}=8 and N\_{2}=2$, each beam restriction group contains $N\_{1}N\_{2}=16$ beams. A total of 139 bits are needed if 2bits are used for each beam as in legacy CBSR, i.e., $B\_{1}=\left⌈log\_{2}\left(\begin{matrix}16\\4\end{matrix}\right)\right⌉= 11bits,$ $B\_{2}^{(k)}=2×16=32bits$, k=0,1,2,3.

eight-two                              BIT STRING (SIZE (139)),

When 1bit is used for each beam in CBSR for Rel-18 type II for CJT, only 75 bits are needed, i.e., $B\_{1}=11 bits,$ $B\_{2}^{(k)}=1×16=16bits$, k=0,1,2,3. A saving of almost 50%

eight-two                              BIT STRING (SIZE (75)),

Question 4: RAN2 would like to ask RAN1 to provide the exact values for the IE CBSR-r18 which currently has same values as in Release-16 field n1-n2-codebookSubsetRestriction-r16:

CBSR-r18 ::= CHOICE {

 two-one BIT STRING (SIZE (16)),

 two-two BIT STRING (SIZE (43)),

 four-one BIT STRING (SIZE (32)),

 three-two BIT STRING (SIZE (59)),

 six-one BIT STRING (SIZE (48)),

 four-two BIT STRING (SIZE (75)),

 eight-one BIT STRING (SIZE (64)),

 four-three BIT STRING (SIZE (107)),

 six-two BIT STRING (SIZE (107)),

 twelve-one BIT STRING (SIZE (96)),

 four-four BIT STRING (SIZE (139)),

 eight-two BIT STRING (SIZE (139)),

 sixteen-one BIT STRING (SIZE (128))

}

1. CMR configurations for codebooks

The L1 parameter excel has the following rows related to how NZP CSI-RS resources are configured for using the Release-18 codebooks:

Row 21 numberOfCMR-r18 in IE CSI-ReportConfig

Row 33 cmrCJT-K-r18 in IE NZP-CSI-RS-ResourceSet

Row 47 cmrDopplerK-r18 in IE NZP-CSI-RS-ResourceSet

Question 5 RAN2 would like to ask if the above parameters could be captured as field description restrictions for nzp-CSI-RS-Resources in IE NZP-CSI-RS-ResourceSet as configuration restrictions for the size of NZP-CSI-RS-ResourceSet?

**3. Actions:**

**To RAN1 group:**

**ACTION:** RAN2 respectfully asks RAN1 to reply above questions.

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

TSG-RAN WG2 Meeting #124 November 2023 Chicago

TSG-RAN WG2 Meeting #125 February 2024 Athens