**3GPP TSG RAN WG1 #108-e R1-2202504**

**e-Meeting, February 21th – March 3rd, 2022**

**Agenda item:** 7.2.6

**Source:** Moderator (Samsung)

**Title:** Summary for Rel.16 NR eMIMO maintenance

**Document for:** Discussion and Decision

1. Introduction

The moderator summary of the maintenance-related issues raised in the submitted contributions for Rel.16 NR\_eMIMO maintenance is given below. The listed maintenance issues are under the usual designations:

* LP: low-PAPR RS
* MB: Multi-beam operation
* MT: Multi-TRP
* MU: Type-II enhancement for MU-CSI
* UL: UL full power transmission
* O: Other

An initial assessment on each of the issues is given (but can be revised based on the outcome of the discussion during the preparation week). The assessment will be used as a basis to select four issues (per chairman instruction) for further discussion in the upcoming weeks.

* *High priority (H):* this includes high-priority item (essential, pending issues, broken spec components) and proposed editorial changes that either enhance the clarity of the specs or correct mistakes
* *Non-essential (N)*: this includes all other purposes such as spec optimization and low priority issues
* *Editorial (E)*: this includes editorial issues that will be handled as editorial CRs (to be communicated to the editors/chairs) and thereby not counted toward the four-thread quota

1. Maintenance issues

The issues are summarized in the following table:

**Table 1 Summary**

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| **#** | **Issue (summary of CR proposal)** | **Companies** | **Initial assessment** | **Company inputs (if any)** |
| MT.1 | In 38.215 section 5.1.5, clarify that in the case of s-DCI based mTRP with scheme 3 or scheme 4, the indicated TCI states is the activated TCI states in the **first slot** with scheduled PDSCH (R1-2201631, R1-2201632)  FL: The issue identified in the problem is valid. However, whether specification change is needed might need some discussion. The current spec with the words “single slot PDSCH” and “multi-slot PDSCH” seems cover this issue. | vivo | H | ZTE: We tend to agree with FL’s assessment that the current TS 38.214 could capture both “single-slot PDSCH” and “multi-slot PDSCH” cases. Hence no specification change is needed herein.  vivo: Agree with FL’s assessment as H. We think the conditions in current spec “when the UE is configured with a single slot PDSCH” and “when the UE is configured with a multi-slot PDSCH” are Rel-15 semi-statically “configured” single/multi-slot repetition which doesn’t cover dynamic repetitions specified in Rel-16. Besides, Rel-16 single-DCI based MTRP schemes requiring “two TCI states” cannot be reflected by the singular form “the indicated TCI state” in current spec.  OPPO: We also think the current spec. can cover the Rel-16 mTRP cases and no specification change is needed for that. The only possible issue is to modify “the indicated TCI state” to “the indicated TCI state(s)”. But we don’t think it is essential and can be a “E”.  QC: We do not think discussions is needed. The current spec is clear as scheme 4 is similar to PDSCH slot aggregation and is already covered, and in scheme 3, there cannot be any change in activated TCI states as both repetitions are within the same slot  Samsung: Since the description of single-slot PDSCH and multi-slot PDSCH in current spec. fully cover the single-TRP and multi-TRP PDSCH scheduling, our view is that the only part which the spec. change is needed is the number of the indicated TCI state (1 or 2). Hence, adding (s) after TCI state seems only valid and this CR seems “E”.  LG: Do not need CR. TDM based MTRP PDSCH scheme is one of multi-slot PDSCH schemes.  Spreadtrum: We think that ‘single-slot PDSCH’ covers scheme 3 and ‘multi-slot PSDCH’ covers scheme 4. Therefore, the proposed change seems not necessary.  DOCOMO: We also think current spec. with the descriptions of “single-slot PDSCH” and “multi-slot PDSCH” have covered this.  Huawei: we agree with OPPO, adding “the indicated TCI state(s) seems to be sufficient.  Ericsson: We also think the only change needed is to change ‘indicated TCI state’ to ‘indicated TCI state(s)’. So this can be an editorial issue. |
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| MU.1 | Correction on eType-II PMI indexing and reporting (R1-2201327)  TS 38.214 section 5.2.3  For Type II CSI feedback, Part 1 contains RI (if reported), CQI, and an indication of the number of non-zero wideband amplitude coefficients per layer for the Type II CSI (see Clause 5.2.2.2.3). The fields of Part 1 – RI (if reported), CQI, and the indication of the number of non-zero wideband amplitude coefficients for each layer – are separately encoded. Part 2 contains the PMI and LI (if reported) of the Type II CSI. The elements of , (if reported) and (if reported) are reported in the increasing order of their indices, , where the element of the lowest index is mapped to the most significant bits and the element of the highest index is mapped to the least significant bits. Part 1 and 2 are separately encoded  ...   * Group 0 includes indices (if reported), (if reported) and ().   FL: Proposed CR is correct and editorial in nature | CATT | E | ZTE: Agree to mark this as “E”.  OPPO: ok  vivo: Agree with the FL’s assessment.  QC: Agree with “E”  Samsung: Agree with “E”  LG: Agree with the FL’s assessment.  Fraunhofer: Agree with FL’s assessment.  Spreadtrum: Agree with ‘E’  DOCOMO: Agree with “E”  Huawei: Agree with “E”  Ericsson: Agree with FL’s assessment. |
| MU.2 | Correction on eType-II freq granularity (R1-2201993)  Adding the following in TS 38.214 section 5.2.1.4 (based on Rel-17 agreement of new condition for wideband reporting, the following is proposed for Rel-16 eType-II)  reportQuantity is set to 'cri-RI-PMI-CQI', or 'cri-RI-LI-PMI-CQI', codebookType is set to 'typeII -r16' or 'typeII-PortSelection-r16' with M\_υ=1 and cqi-FormatIndicator is set to 'widebandCQI', or  FL: Not essential and could cause some late implementation change. Since this was proposed in past meeting(s) and some **conclusion is needed** – either without or after email discussion) | Samsung | N | ZTE: Agree to mark this as “N”. Our understanding is the issue of PMI frequency granularity has been addressed by concluding PMI format is not used for Rel-16 eType II codebooks.  OPPO: Agree to FL’s assessment  vivo: Agree with the FL’s assessment.  QC: Agree with FL’s assessment and ZTE.  Samsung: the current spec is incorrect since it says that the frequency granularity is always subband (yellow highlighted text below). This is not true when (implying WB precoder) and cqiForamt=WB. The CSI frequency granularity should be wideband in this case. Note: the same issue has been discussed in Rel17 and a solution (highlighted green) has been specified. The same solution can also be used for Rel.16 codebook.  5.2.1.4, 38.214  A CSI Reporting Setting is said to have a wideband frequency-granularity if  - *reportQuantity* is set to 'cri-RI-PMI-CQI', or 'cri-RI-LI-PMI-CQI', *cqi-FormatIndicator* is set to 'widebandCQI' and *pmi-FormatIndicator* is set to 'widebandPMI', or  - *reportQuantity* is set to 'cri-RI-PMI-CQI', or 'cri-RI-LI-PMI-CQI', *codebookType* is set to 'typeII-PortSelection-r17' with and *cqi-FormatIndicator* is set to 'widebandCQI', or  - *reportQuantity* is set to 'cri-RI-i1' or  - *reportQuantity* is set to 'cri-RI-CQI' or 'cri-RI-i1-CQI' and *cqi-FormatIndicator* is set to 'widebandCQI', or  - *reportQuantity* is set to 'cri-RSRP' or 'ssb-Index-RSRP' or 'cri-SINR', or 'ssb-Index-SINR'  otherwise, the CSI Reporting Setting is said to have a subband frequency-granularity.  LG: Agree with the FL’s assessment.  Fraunhofer: Agree with the FL’s assessment.  Spreadtrum: Agree with the FL’s assessment.  DOCOMO: Agree with “N” and ZTE’s comment.  Huawei: Agree with “N” and ZTE and FL comment.  Ericsson: Agree with FL assessment that this should be “N” |
| MU.3 | NZC partitioning in group 1 and 2 for eType-II (R1-2202121, R1-2202314/2315)  Proposal to change coefficient partitioning for eType-II based on agreement for Rel-17 Type-II codebook  Proposal: For Rel-16 Enhanced Type II and Enhanced Type II port-selection, clarify that UCI Group 1 includes the max(0,⌈K^NZ/2⌉-υ) highest priority elements of i\_(2,4,l) and the max(0,⌈K^NZ/2⌉-υ) highest priority elements of i\_(2,5,l) (l=1,…,υ). UCI Group 2 includes the min(K^NZ-v,⌊K^NZ/2⌋) lowest priority elements of i\_(2,4,l) and the min(K^NZ-v,⌊K^NZ/2⌋) lowest priority elements of i\_(2,5,l) (l=1,…,υ)  Corrections are proposed in TS 38.212 (sec 6.3.2.1.2) and 214 (section 5.2.3):   * Changing to * Changing to   FL: The proposal seems technically correct although the identified problems could be corner cases (hence may be non-essential). This benefits from some discussion and **needs some conclusion**. | Qualcomm, Nokia/NSB | H | ZTE: Agree to mark this as “H” and discuss this issue in RAN1#108e.  OPPO: Agree to FL’s assessment  vivo: Agree to discuss this issue.  QC: Agree with FL’s assessment  Samsung: OK  LG: It seems non-essential (N). Related to this issue on , it was discussed in the past that this is a corner case and will not occur in practice almost surely.  Fraunhofer: This is a corner case and it was already discussed last meetings. Therefore, we think it should be marked as “N”.  Spreadtrum: Non-essential  DOCOMO: Agree with “H”. It can be discussed to align with the agreement in Rel-17.  Huawei: Agree with “H”. It is OK to align across Rel16/17 spec text for the same matter.  Ericsson: Agree with FL’s assessment. |
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1. Discussion and proposal

From the inputs shared by participating companies during the preparation phase, the following **observation** can be made:

* The following issue can be handled as E (a part of editorial CR): MU.1
* The following issues can be designated as H (requiring discussion and additional agreements/conclusions): MT.1, MU.3

In addition, almost all commenting companies agree with the FL assessment that MU.2 is non-essential. Since this has been proposed for several meetings, a conclusion should be made.

The following **proposals** are made:

* RAN1#108-e email thread assignment for the maintenance on Rel-16 NR\_eMIMO:
  + Email thread 1 (Clarification on s-DCI based mTRP for scheme 3 or 4) addressing MT.1; moderated by vivo ([Rakesh])
  + Email thread 2 (NZC partitioning across groups 1/2 and PMI indexing correction for eType-II CSI) addressing MU.1 and MU.2; moderated by Qualcomm ([Chenxi])

In addition, the following **proposed conclusion** is made:

* There is no consensus on refining Rel-16 eType-II frequency granularity based on Rel-17 agreement on FDD CSI (as proposed in R1-2201993). Therefore, such refinement is not supported.

# References

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| 1 | R1-2201327 | Draft CR on Type II and enhanced Type II CSI feedback | CATT |
| 2 | R1-2201631 | Draft CR on indicated TCI states for single-DCI based MTRP schemes | vivo |
| 3 | R1-2201632 | Draft CR on indicated TCI states for single-DCI based MTRP schemes | vivo |
| 4 | R1-2201993 | Correction on frequency granularity of CSI based on Rel.16 Type II codebooks | Samsung |
| 5 | R1-2202121 | Discussion on coefficients partition in eT2 CSI | Qualcomm Incorporated |
| 6 | R1-2202314 | Correction in the number of NZC mapped in Group 1 and 2, 38.212 | Nokia, Nokia Shanghai Bell |
| 7 | R1-2202315 | Correction in the number of NZC mapped in Group 1 and 2, 38.214 | Nokia, Nokia Shanghai Bell |