**3GPP TSG RAN WG1 #110 R1-2206783**

**Toulouse, France, August 22nd – 26th, 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
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)** |
| MB.1 | R1-2207502: Change the condition “the UE is not provided a spatial setting for a PUCCH transmission” to “the UE is not provided a spatial setting for a PUCCH transmission in FR1” in 6.1.1 of TS 38.213.FL note: Not needed. There is no contradiction/ambiguity in current specification because ‘the UE is not provided a spatial setting for a PUCCH transmission’ in the first paragraph means that ‘UE is provided PUCCH resources but with no spatial setting configured’ and the R16 default beam/PLRS mode described in the second paragraph includes that ‘the UE is not provided PUCCH resources for the active UL BWP of serving cell c’FL note2: Based on ASUSTek’s further clarification, this issue seems valid and could be treated as ‘H’. Better way of correction may be …- If - the UE is not provided *enableDefaultBeamPL-ForPUSCH0-0* and the PUSCH transmission is scheduled by DCI format 0\_0 and the UE is not provided a spatial setting for a PUCCH transmission, or - the PUSCH transmission is scheduled by DCI format 0\_1 or DCI format 0\_2 that does not include an SRI field, or - *SRI-PUSCH-PowerControl* is not provided to the UE,  the UE determines a RS resource index $q\_{d}$ with a respective *PUSCH-PathlossReferenceRS-Id* value being equal to zero where the RS resource is either on serving cell$c$ or, if provided, on a serving cell indicated by a value of *pathlossReferenceLinking* | ASUSTeK | N | [ASUSTeK] We found there is a third paragraph which we shall reference rather than second paragraph. Sorry for confusion. When UE is not provided a spatial setting for a PUCCH transmission in FR2 but is provided with enableDefaultBeamPL-ForPUSCH0-0 set 'enabled', since there are two paragraph below in TS 38.213 for determining PL RS for PUSCH scheduled by DCI format 0\_0, the ambiguity issue still exists between first paragraph and third paragraph.**(First paragraph in TS 38.213)**- If - the PUSCH transmission is scheduled by DCI format 0\_0 and the UE is not provided a spatial setting for a PUCCH transmission, or … the UE determines a RS resource index $q\_{d}$ with a respective *PUSCH-PathlossReferenceRS-Id* value being equal to zero where the RS resource is either on serving cell$c$ or, if provided, on a serving cell indicated by a value of *pathlossReferenceLinking***(Third paragraph in TS 38.213)**- If - the PUSCH transmission is scheduled by DCI format 0\_0 on serving cell $c$, - the UE is not provided a spatial setting for PUCCH resources on the active UL BWP of the primary cell [11, TS 38.321], and- the UE is provided *enableDefaultBeamPL-ForPUSCH0-0*  the UE determines a RS resource index $q\_{d}$ providing a periodic RS resource configured with *qcl-Type* set to 'typeD' in the TCI state or the QCL assumption of a CORESET with the lowest index in the active DL BWP of the serving cell $c$[LG/FL] Thanks ASUSTek for further clarification. Second FL’s note is added based on the clarification.[Qualcomm]: The spec is correct to our understanding. It is meant for FR2. There is no conflict between 213 and 214[Lenovo] Not needed. Agree with FL’s assessment[ZTE]: Not needed. As a general requirement, if *enableDefaultBeamPL-ForPUSCH0-0* is provided, the UE behavior under the third paragraph should be performed, otherwise, the first paragraph is performed. [Google]: The change looks incorrect and unnecessary. Spatial setting and default beam are only applicable for FR2.[Apple] It seems to be minor issue for us based on further clarification from ASUSTek. The third paragraph, i.e., when enableDefaultBeamPL-ForPUSCH0-0 is provided, proceeds the first paragraph. But we are open to have some discussion.[Nokia/NSB] Not needed, the use of spatial settings in FR2, hence the negation of this for FR1, is rather clear.  |
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| MU.1 | R1-2206372: Clarify in section 5.2.3 that CSI Part 2 for Enhanced Type II CSI feedback can contain LI if reportQuantity in CSI-ReportConfig contains LI parameter (which, as specified in TS38.214, needs to be calculated and reported).- For Enhanced Type II CSI feedback, Part 1 contains RI (if reported), CQI, and an indication of the overall number of non-zero amplitude coefficients across layers for the Enhanced Type II CSI (see Clause 5.2.2.2.5). The fields of Part 1 – RI (if reported), CQI, and the indication of the overall number of non-zero amplitude coefficients across layers – are separately encoded. Part 2 contains the PMI and LI (if reported) of the Enhanced Type II CSI. Part 1 and 2 are separately encoded.FL note: Correct assessment and can be treated as an editorial change | CATT | E | [Qualcomm]: Not support. This is late change for R16 eT2 CSI feedback. Lots of IODT work have been done, and no issue is reported. This means that there might exist UEs implementing following current spec (i.e., no LI reporting for eT2 even if LI is configured in report quantity). So, accepting this change has NBC risk which affect existing UEs. Besides, 212 spec has no table for LI reporting in eT2 as well.[Lenovo] Although the editorial change seems fine, we understand QC’s concerns regarding NBC. Current 212 spec does not contain LI field in mapping order of CSI fields tables corresponding to eType-II and eType-II PS codebook, and hence this editorial change may require much more modifications than what appears. Further discussion is needed[CATT] We can understand the concern from QC. However, in current specs, there is no restriction on LI configuration for Rel-16 eType II. If LI is configured, according current specs, LI should be reported. But it is unclear how to report LI when *reportQuantity* contains LI. We are open to discuss the following two solutions.•        Add the restriction on LI for Rel-16 eType II. If Rel-16 eType II codebook is configured by RRC parameter, the LI is not expected to be configured in *reportQuantity*.•        Add the LI reporting in 214 spec and LI field in 212 tables. If *reportQuantity* contains LI for Rel-16 eType II codebook, the LI should be reported in Part II of CSI field. [Nokia/NSB] Agree with QC. LI is a wideband indicator which is mapped in the wideband part of a CSI, either Part 1 for wideband reporting on PUCCH, or Part 2-wideband for subband reporting on PUCCH/PUSCH. For R16-Type-II CBs, there is no wideband part of a CSI, so if we introduced this change, we would also need to decide which of the three priority groups LI maps to and update the tables in 212 accordingly[Apple] CATT raised a good issue. However, we prefer to clarify that L1 cannot be configured as part of reportQuantity, i.e., NW configures “cri-RI-PMI-CQI” instead of “cri-RI-LI-PMI-CQI” for eType II codebook.  |
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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):
* The following issues can be designated as H (requiring discussion and additional agreements/conclusions):

The following **proposals** are made:

* RAN1#109-e email thread assignment for the maintenance on Rel-16 NR\_eMIMO:
	+ Email thread 1 ...
	+ Email thread 2 ...

# References

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| 1 | [**R1-2206372**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_110/Docs/R1-2206372.zip) | Clarification of LI reporting for Enhanced Type II CSI feedback | CATT |
| 2 | [**R1-2207502**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_110/Docs/R1-2207502.zip) | Correction on PL RS determination for PUSCH scheduled by DCI format 0\_0 | ASUSTeK |
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