**3GPP TSG RAN WG1 #110**  **R1-2207877**

**Toulouse, France, August 22nd – 26th, 2022**

**Agenda item:** 8.1

**Source:** Moderator (Huawei)

**Title:** Moderator Summary for Rel.17 NR FeMIMO maintenance: CSI Enhancement (Round 0)

**Document for:** Discussion and Decision

1. Introduction

The moderator summary of the maintenance-related issues raised in the submitted contributions for Rel.17 NR\_FeMIMO CSI enhancement is given below, with 6 CR drafts. Company’s comments are requested **before Monday 15:00 (local time in France).**

Note that there is **no preparation phase**, as the discussion is based on company CR. Subject to Mr. Chairman’s discretion, the first day of meeting week will likely have to be used to converge on what to handle in RAN1 #110 and the remaining four days will be used to converge on selected CRs.

1. Maintenance issues

R1-2205933 Draft CR on CPU occupied for MTRP CSI in TS38.214 ZTE

R1-2206257 Draft CR for CSI-RS port restriction for mTRP CSI OPPO

R1-2207528 Correction on slot offsets of CSI-RS resource pairs for MTRP Huawei, HiSilicon

R1-2207568 Draft CR 38.214 Rel-17 MTRP-CSI\_number of CPUs Nokia

R1-2207612 Draft CR on channel measurement with two Resource Groups Ericsson

R1-2207656 Correction of CSI assumptions over multiplexing NCJT CSI reports in PUCCH Huawei, HiSilicon

* Issue #1: 38.214 CPU Occupancy for Multi-TRP CSI (R1-2205933 ZTE, R1-2207568 Nokia, R1-2207612 Ericsson)

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| **Company** | **Company inputs (if any)** |
| Mod | Some spec updates are suggested by ZTE, Nokia, and Ericsson to address the latest design of UE capability of MTRP CPU occupancy. Suggested changes are slightly different among proponents.  Mod’s Assessment: Propose to discuss in RAN1 #110 |
| vivo | Agree with Mod’s assessment. |
| OPPO | Agree to discuss the wording. |
| Apple | Open to discuss |
| Samsung | Support to discuss. |
| ZTE | Agree to discuss the issue. |
| LG | Support to discuss. |
| DOCOMO | Support to discuss. |
| Nokia/NSB | Support |
| Lenovo | Open to discuss |
| Intel | OK |
| Ericsson | support to discuss |
| Mod | Will be discussed in RAN1 #110. Mod is to prepare discussion text |

* Issue #2: 38.214 CSI-RS port restriction for MTRP (R1-2206257, Oppo)

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| **Company** | **Company inputs (if any)** |
| Mod | In R15/16, the maximum number of CSI-RS ports contained by each resource per CSI-RS resource set is 16 when Ks=2 and is 8 when 2<K\_s≤8. For mTRP CSI feedback, the UE complexity to process each S-TRP CSI should not be increased and this restriction can be extended to each CMR group which corresponds to one TRP.  That is, for each CMR group in a CMR set, the maximal number of CSI-RS ports is 16 when the number of CMRs in the CMR group is 2, while the maximal number of CSI-RS ports is 8 when the number of CMRs is larger than 2. If the number of CMR in the CMR group is 1, up to 32 ports can be configured for the CMR.  Mod’s Assessment: Propose to discuss in RAN1 #110, at least to align our understanding. |
| Vivo | Fine to discuss and align our understanding. |
| OPPO | Support to discuss this issue. At least RAN1 should have the same understanding on whether the restriction on the number of CSI-RS ports based on Ks in Rel-15/16 is applicable to Rel-17 or not. |
| Apple | Open to discuss |
| Samsung | Support to discuss. Our understanding is that the restriction on the number of CSI-RS ports for Rel-15/16 and Rel-17 are separate things. |
| ZTE | We share the same views with Samsung that the restriction on number of CSI-RS ports for Rel-17 should be separately discussed, rather than directly copy what we had for Rel-15/16. Then, for NCJT pair, at least for number of CMRs in the CMR group is 2, the maximum number of CSI-RS ports should be 32 rather than 16. |
| LG | Open to discuss |
| DOCOMO | Okay to discuss. |
| Nokia/NSB | Open to discuss. The solution proposed by Mod sounds reasonable. |
| Lenovo | Open to discuss |
| Intel | OK to discuss. We have similar understanding with Samsung and ZTE – NCJT CSI can be considered separately for the constraints on the number of ports. |
| Ericsson | Ok to discuss. We have similar understanding as Samsung, ZTE and Intel that the case of NCJT CSI should be considered separately. |
| Mod | Will be discussed in RAN1#110. Mod is to prepare discussion text |

* Issue #3: 38.214 Correction on slot offsets of CSI-RS resource pairs (R1-2207528, Huawei)

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| **Company** | **Company inputs (if any)** |
| Mod | The brackets for configuring slot offsets of the two resources in a CSI resource pair for Multi-TRP CSI measurement shall be removed in order to capture the agreement and avoid ambiguous understanding of CSI-RS resource configuration at time domain.  Mod’s Assessment: Propose to discuss in RAN1 #110. |
| Vivo | Agree with Mod’s Assessment. |
| OPPO | Agree to discuss. |
| Apple | Agree to discuss |
| Samsung | Support to discuss. |
| ZTE | Open to discuss. |
| LG | Agree with Mod’s Assessment. |
| DOCOMO | Support to discuss. |
| Nokia/NSB | Agree with Mod |
| Lenovo | Agree with Mod’s assessment |
| Intel | Agree with the Moderator |
| Ericsson | Ok |
| Mod | Will be discussed in RAN1 #110. Mod is to prepare discussion text |

* Issue #4: 38.213 Correction of CSI assumptions over multiplexing NCJT CSI reports (R1-2207656, Huawei)

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| **Company** | **Company inputs (if any)** |
| Mod | For Rel-17 NCJT CSI reporting, the UE will report a joint RI index corresponding to one of four RI combinations. The assumption that each CSI report indicates rank 1 in 38.213 for CSI report multiplexing is ambiguous when determining PUCCH payload for Part 2 CSI since the joint RI index (or RI combination) can be interpreted differently, for example considering rank combination {1,2} as rank 1.  Moreover, for NCJT “Mode 2”, the payload of part 2 CSI is varied depending on the preference of transmission hypothesis reported by the UE, i.e. single TRP CSI or NCJT CSI determined by the value of CRI. It gives rise to further ambiguity of determining hypothetical PUCCH resource assignment or a number of part 2 CSI reports if multiplexing NCJT Mode 2 CSI reports.  Mod’s Assessment: Propose to discuss in RAN1 #110. |
| vivo | Agree with Mod’s Assessment. Detailed wording needs further check. |
| OPPO | Fine to discuss it. However, will any company really consider rank combination {1,2} as rank 1? As a straightforward understanding, rank 1 would mean {1,1} for NC-JT CSI when determining PUCCH payload for Part 2 CSI. |
| Apple | We are open to discuss. |
| Samsung | Support to discuss. It seems good clarification for making spec clearer. |
| ZTE | Open to discuss. |
| LG | Open to discuss. |
| DOCOMO | Okay to discuss. |
| Nokia/NSB | Ok to discuss. In our understanding, there is no ambiguity for NCJT reporting as {1,1} is the natural interpretation, for 2 TRPs, of rank 1 assumption. (sorry for the confusion, it’s WB reporting that is only supported for Mode 1 with X=0. Of course, both Mode 1 and Mode 2 can be reported on PUCCH). It seems reasonable to make the same assumption for both Mode 1 and Mode 2 reporting. |
| Lenovo | Agree with OPPO, Nokia. We don’t see ambiguity either |
| Intel | OK to discuss |
| Ericsson | Similar view as OPPO and Nokia. |
| Mod | Will be discussed in RAN1 #110. Mod is to prepare discussion text |

1. Conclusion

Following four issues are to be discussed in RAN1 #110. The Moderator is to prepare discussion text for next round

* Issue #1: 38.214 CPU Occupancy for Multi-TRP CSI (R1-2205933 ZTE, R1-2207568 Nokia, R1-2207612 Ericsson)
* Issue #2: 38.214 CSI-RS port restriction for MTRP (R1-2206257, Oppo)
* Issue #3: 38.214 Correction on slot offsets of CSI-RS resource pairs (R1-2207528, Huawei)
* Issue #4: 38.213 Correction of CSI assumptions over multiplexing NCJT CSI reports (R1-2207656, Huawei)