**3GPP TSG RAN WG1 Meeting #108-e R1-220xxxx**

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

**Agenda Item: 8.1.4**

**Source: (Moderator) Huawei, HiSilicon**

**Title: Summary of CSI enhancements for MTRP and FDD (Round 1)**

**Document for: Discussion and Decision**

# Introduction

Enhancement on CSI measurement and reporting:

* Evaluate and, if needed, specify CSI reporting for DL multi-TRP and/or multi-panel transmission to enable more dynamic channel/interference hypotheses for NCJT, targeting both FR1 and FR2
* Evaluate and, if needed, specify Type II port selection codebook enhancement (based on Rel.15/16 Type II port selection) where information related to angle(s) and delay(s) are estimated at the gNB based on SRS by utilizing DL/UL reciprocity of angle and delay, and the remaining DL CSI is reported by the UE, mainly targeting FDD FR1 to achieve better trade-off among UE complexity, performance and reporting overhead

For Rel-17 CSI enhancement in RAN1 108-e, proposals are roughly classified as one of three categories to facilitate RAN1 meeting schedule and efficient RAN1 decisions:

* **Proposals of Further Enhancement:** some proposals need RAN1 high-level agreements/common understanding firstly before discussing associated TP draft. It is targeted to make a RAN1 decision during Week 1, to see any agreement can be made by Email (or GTW for exceptional cases). If does, we will translate the agreement into agreeable TP in Week 2 at least, i.e. there is no follow-up email discussion after March 3.
* **Text Proposals of Correction:** sometext proposals need RAN1 discussion firstly during Round 0, to see whether specification corrections are needed, like normal Rel-15/16 CR preparation phase. Companies are encouraged to share your views, and suggested changes if need in your view. We will consolidate CR draft and RAN1 comments in an agreeable TP during Week 1.
* **Text Proposals of Editorial Changes:** some text proposals might be obvious editorial changes, up to FL understanding, assuming that they are agreeable or straightforward at least. If not, they will be moved up for further RAN1 discussion. We will combine all editorial changes during Week 1.

# Summary of CSI enhancement for FDD

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| **Samsung** | **Proposal 3:** Regarding Rel.17 codebook parameters,   * + allowed rank (via RI-restriction-r17) can’t be 3 or 4 when (i.e., paramCombination-r17=5) and |

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| Company | Comments |
| **Mod** | Let us discuss this issue raised by Samsung, to see whether we need an explicit restriction in RAN1 spec (or conclusion), or it is left to gNB’s discretion. Could you please share your view? Thank you! |
| **CATT** | A proper gNB implementation could avoid such configuration. Further limitation is not essential. |
| **Samsung** | @CATT: the proposal is not about limitation. It is about addressing the following three “infeasible” configurations. The UE can’t calculate CSI for these configurations. So, what is the point of supporting them?   * 4 CSI-RS ports, paraComb=5 (alpha=1/2), and RI-restriction allowing only rank 3 * 4 CSI-RS ports, paraComb=5 (alpha=1/2), and RI-restriction allowing only rank 4 * 4 CSI-RS ports, paraComb=5 (alpha=1/2), and RI-restriction allowing only rank 3 or 4 |
| **ZTE** | We still cannot see the point to agree on this proposal. Even rank 3 and rank 4 cannot be feasible for these combinations, what is the issue to allow them? Seems no issue. Nothing will be wrong for the current specification to allow rank 3 and 4. Further, same situation can happen as well for Rel-16 that some combination can produce small number of NZ coefficients, but we don’t have this restriction in Rel-16. Hence we cannot see strong reason to have this in Rel-17. |
| **Lenovo/MotM** | We do not believe this is an important issue. The number of CSI-RS ports, alpha and RI restriction are network configured. The corner cases of concern mentioned by Samsung correspond to unreasonable network design that should be avoided by implementation. |
| **Qualcomm** | After taking a closer look, we think Samsung’s evaluation is reasonable. Normally, all the configurations in the spec would go through IODT test before real deployment, so it is preferred to ban these invalid configurations from the spec to avoid unnecessary testing work. So, we can support this proposal. |
| **OPPO** | We are fine to have this restriction in specification to avoid some unreasonable configuration. |
| **DOCOMO** | We are okay with the restrictions. |
| **LGE** | We believe gNB can avoid such infeasible configurations without Proposal 3. So, we slightly prefer to leave this issue to gNB’s discretion. |
| **Intel** | We are OK with the proposal.  At the same time, we acknowledge that there is no strong need to make a spec change since the configuration can be avoided by gNB, also if it is configured to the UE UE can just select rank 1-2 (not sure if gNB will ever configure RI restriction to allow only rank 3-4 which is not working). |

# Summary of CSI enhancement for Multi-TRP

**Proposal 6: Additional restriction to decouple enhanced group-based beam reporting and enhanced multi-TRP CSI reporting**

This issue is raised by Ericsson in R1-2202276 as following:

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| **Company** | **View** |
| **Ericsson** | * The UE is not expected to be configured with higher layer parameter cmrGroupingAndPairing-r17 in an NZP CSI-RS resource set that is indicated as the second NZP CSI-RS resource set via higher layer parameter resourcesForChannel2 in CSI-AssociatedReportConfigInfo. * For a higher layer parameter resourcesForChannelMeasurement configured with two Periodic or emipersistent NZP CSI-RS resource sets, the UE is not expected to be configured with higher layer parameter cmrGroupingAndPairing-r17 in any of the two NZP CSI-RS resource sets. |

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| Company | Comments |
| **Mod** | It seems to me that a conclusion may be needed at least, given company feedback, about whether above restriction is needed. If we can reach a conclusion to have explicit restrictions, please inform your RAN2 colleagues. How to take into account the conclusion in RAN2 design is up to RAN2. If we can’t, RAN2 can certainly have more freedom.  Can you share your view for Ericsson’s suggestions in order to separate two Rel-17 features at RRC level? Thank you! |
| **Lenovo/MotM** | We agree with the FL’s assessment that a conclusion is needed to avoid conflict between the two configurations |
| **OPPO** | Either a conclusion or an agreement with restriction on specification is fine to us. If we have a conclusion, it would be better to include it in the LS to RAN2. |
| **DOCOMO** | We prefer an agreement on the restrictions. |
| **LGE** | We support Ericsson’s proposal. |
| **Intel** | For this issue we prefer to support agreement to make sure that the combination of two features are not supported. |
| **CMCC** | We prefer to have a conclusion to decouple these two features. |
| **ZTE** | We share the same views that one conclusion (rather than one agreement) is sufficient since that there is no clear UE behaviour for this combination in current spec, i.e., it is just an error case. |