**3GPP TSG RAN WG1 #104-e R1-2101181**

**e-Meeting, January 25th – February 5th, 2021**

**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

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
  + *H2:* The proposal can be endorsed without discussion in the upcoming weeks (i.e. unless pointed out otherwise, the moderator will propose to the chair that the proposal be endorsed by Oct 23rd thereby not counted toward the four-thread quota). It can be merged with any of the assigned threads without any further discussion. This includes TPs associated with previous agreements.
* *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)

1. Maintenance issues

The issues are summarized in the following table:

**Table 1 Summary**

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| **#** | **Issue (summary)** | **Companies** | **Initial assessment** | **Company inputs (if any)** |
| MB.1 | Clarifying that multi-CC simultaneous TCI update can be applied to CORESET#0  FL: discussed in the pre- phase in the last meeting but not agreed | Vivo | N | vivo: should be H and can be combined with MB.2.  There is obvious conflict between RAN1 spec and RAN2 spec. The spec impact should be clarified. We are also fine with conclusion.  QC: Agree with initial assessment.  Ericsson: not needed.  Samsung: Agree with FL.  Huawei/HiSilicon: We agree with vivo that there is potential misalignment between RAN1 and RAN2 specs, and support discussinng this issue.  MediaTek: Agree with FL’s assessment |
| MB.2 | For multi-CC simultaneous TCI update, clarify which BWP’s tci-States-ToAddModList is applied to CORESET#0 if CORESET #0 belongs to both the active BWP and the initial BWP.  FL: may not need spec change | Vivo | N | vivo: should be H and can be combined with MB.1.  We think this issue should be discussed. There is ambiguity on current specification.  QC: Agree with initial assessment.  Ericsson: why is this ambiguous? Why would it refer to anything but the active BWP?  Samsung: Agree with FL.  Huawei/HiSilicon: We share similar understanding as Ericsson that it only can be the active BWP. A quick conclusion would be good if this is common understanding.  MediaTek: Agree with FL’s assessment |
| MB.3 | Alignment of RRC parameter name: enableDefaultBeamForCCS 🡪 enableDefaultBeamForCCS-r16 | CATT | E | LG: ok, prefer to be handled by Editor  ZTE: If our understanding is correct, the suffix ‘-r16’ has been removed for most of Rel-16 RRC parameters in the latest TS 38.214 for simplifying the presentation, unless that there is some ambiguities between Rel-15 current one and Rel-16 introduced one. If so, this update seems to be unnecessary.  vivo: In TS38.331 “*CrossCarrierSchdulingConfig*” field descriptions, the name is also “*enableDefaultBeamForCCS*”.  QC: Agree with initial assessment.  Ericsson: According to instructions, RRC parameter name alignment should be directly communicated to spec editors.  Samsung: it can be directly handled by Editor. Also, there is a parameter name “enableDefaultBeamForCSS”, this should be aligned too.  Intel: Prefer this handled by editor. Regarding the proposed change - ASN.1 variable names with suffix should be used only when need for clarify of the spec, so it is better to use “enableDefaultBeamForCCS” instead of “enableDefaultBeamForCCS-r16”. |
| MB.4 | QCL assumption for CSI-RS/CSI-IM for L1-SINR measurement when it is not provided (R1-2100115, proposal 1)  FL: This was discussed in pre-phase in last meeting | OPPO | N | LG: agree with FL’s initial assessment  QC: Agree with initial assessment.  OPPO: The UE behavior is undefined if this issue is not resolved.  Ericsson: agree with FL’s initial assessment  Samsung: Agree with FL.  Huawei/HiSilicon: We support discussing this issue. The UE assumption and expectation is unclear when CSI-RS is not provided with QCL indication.  MediaTek: Agree with FL’s assessment |
| MB.5 | Clarify whether SSB can be configured for BFD (R1-2100115, proposal 2)  FL: This was discussed in pre-phase in last meeting | OPPO | N | LG: agree with FL’s initial assessment  ZTE: If our understanding is correct, this TP also has impacts on PCell BFR. Therefore, if discussed, Rel-15 maintenance is preferred.  QC: Agree with initial assessment.  OPPO: This issue has impact on both PCell BFR and SCell BFR. So we prefer to fix it in rel-16. the text descriptions on SSB in Section 6 (link recovery) of 38.213 are not aligned and would cause confusion to UE behavior.  Ericsson: agree with FL’s initial assessment  Samsung: Agree with FL.  MediaTek: OK to discuss either Rel-15 or Rel-16 maintenance |
| MB.6 | BFD RS related RRC parameter name correction for *failureDetectionResourcesToAddModList* (R1-2100279, proposal 1) | ZTE | E | LG: ok, prefer to be handled by Editor  QC: Agree with initial assessment.  Ericsson: According to instructions, RRC parameter name alignment should be directly communicated to spec editors.  Samsung: it can be directly handled by Editor.  Docomo: Agree with E. |
| MB.7 | Clarify the candidate cells to determine the minimal SCS for 28 symbols for BFR (R1-2100279, proposal 2) | ZTE | H | LG: we think that this issue is not of high priority.because current text may have no issue because ‘**the** at least one SCell’ would mean the SCell(s) in beam failure.  QC: This may not be needed. Our understanding is that current spec means interpretation 1 in proposal 2 of R1-2100279.  OPPO: The current spec seems clear and there is no issue. So, this is not needed.  Ericsson: OK to discuss. But LG’s interpretation is also valid.  Samsung: Agree with FL’s assessment and agree with ZTE’s proposal.  Docomo: Agree with H.  Lenovo/MOT: Agree to discuss.  Huawei/HiSilicon: It would be good to clarify this, even if it is just a conclusion.  MediaTek: Sentence may lead to confusion. We are OK to discuss.  Intel: Agree with LGE. The issue may not be critical and ambiguity can be handled by implementation by using larger value among possible. |
| MB.8 | Reset CORESEPoolIndex=0 for all CORESETs for mDCI mode after BFR (R1-2100279, proposal 3) | ZTE | H | LG: not essential. BFR with two CORESET pools is not of typical assumption for Rel-16 and is now being studied for Rel-17. Even if two CORESET pools are configured with Rel-16 BFR, it is unclear what cannot be handled by gNB implementation, e.g. use one CORESET pool/TRP for a while to communicate with the UE after beam failure.  QC: Not essential. Agree with LG.  OPPO: It is not an essential issue for rel16. It can be resolved by system implementation. Do not support to discuss it.  Ericsson: not support. This would mean that the UE modifies its RRC configuration, which was discussed and ruled out for DAPS.  Samsung: Agree with FL’s assessment but we think that restricting monitoring the CORESETs with CORESETPoolIndex = 1 before MAC-CE activation for TCI state of the CORESETs is sufficient rather than reseting CORESETPoolIndex of all CORESETs as 0.  Docomo: Not support. This should be N. In current spec, after BFR completion, gNB can update TCI-state of each CORESET associated with different *CORESETPoolIndex* by MAC CE. However, if we adopt the proposal, *CORESETPoolIndex* of all CORESETs are reset to 0, and gNB needs RRC reconfiguration to set different *CORESETPoolIndex* to each CORESET.  MediaTek: This issue should be handled in beam management for MTRP AI in Rel-17.  Intel: Not essential.  CATT: non-essential. |
| MB.9 | Remove bracket [and/] to be aligned with agreements in last RAN1 meeting that NZP+ZP IMR based L1-SINR is not supported (R1-2100339, proposal 1) | CATT | E | LG: ok, prefer to be handled by Editor  vivo: support  QC: Agree with initial assessment.  Ericsson: ok  Samsung: it can be directly handled by Editor.  Docomo: Agree with E. |
| MB.10 | Clarify that one of the conditions to apply q\_new to PUCCH after BFR should be that UE identified a q\_new (R1-2101272) | Huawei/HiSilicon | E | LG: support  vivo: support  QC: Agree with initial assessment.  Ericsson: ok  Samsung: it can be directly handled by Editor.  Docomo: Agree with E. |
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| MT.1 | The issue of closed loop index vs out-of-order operation in mTRP:   * OPPO (R1-2100113) proposed to specify a default closed loop index for CORESETPoolIndex = 1 for out-of-order operation. * ZTE (R1-2100281) also made proposal on closed loop index for UE supporting out-of-order operation * Huawei/HiSi (R1-2101256) proposed to capture the note on out-of-order operation vs closed loop index made during UE capability discussion. | OPPO, ZTE, Huawei/HiSi | H | LG: It was supposed to be discussed in RAN 1 maintenance due to limited time in UE feature session. We agree with FL’s assessment.  ZTE: This issue is very important to be solved. Otherwise, MDCI based MTRP cannot work in FR1 because close loop index is always 0 in some typical cases as discussed in our tdoc.  Vivo: fine to discuss.  QC: Given the note was added in UE feature, we think it is better for this issue to be handled there.  Ericsson: Ok to discuss the issue.  Samsung: Agree with FL  Docomo: Agree with H.  Lenovo/MOT: Agree to discuss.  Huawei/HiSilicon: Agree with FL’s assessment.  Intel: Ok to discuss given it is unresolved in UE feature discussion  CATT: Agree to discuss this issue. |
| MT.2 | The issue of UL signal overlapping with two HARQ-ACK PUCCHs associated with different TRPs:   * OPPO (R1-2100114) proposed TP to specify that the UE does not expect that two PUCCH/PUSCH triggered by two different TRP will overlap with one same uplink signal at the same time * vivo(R1-2100417) proposed TP to specify that PUCCH of CSI/SR/LRR does not overlap with two HARQ-ACK PUCCHs.   FL: was discussed in pre-phase in previous meeting | OPPO, vivo | N | LG: Agree with FL’s assessment  Vivo: Current spec doesn’t have any restriction on this overlapping case. However, it may happen in M-DCI-based MTRP with separate HARQ-ACK feedback. According to current spec, the UE would apply the dropping or multiplexing rule defined for Rel-15/16 single TRP and may transmit the HARQ-ACK to the wrong TRP  Apple: We are fine to discuss this issue which has been raised multiple times if scope permits  QC: Agree with FL’s assessment  Ericsson: Agree with FL’s assessment.  Samsung: Agree with FL  Huawei/HiSilicon: Agree with FL’s assessment.  Intel: Agree with FL, this is an old issue that was not supported.  CATT: Agree to discuss this issue. |
| MT.3 | The issue of active BWP operation in M-DCI based mTRP:   * Lenovo/MOT (R1-2100298) proposed that If a UE detects two DCIs indicating a same active DL BWP change in a same slot, the UE is not required to receive or transmit in the cell during a time duration from the end of the third symbol of a slot where the UE receives the DCI until the beginning of a slot indicated by the smaller slot offset value of the time domain resource assignment fields in the two DCI   FL: was discussed in pre-phase in previous meeting and some companies commented there is no issue in current spec | Lenovo/MOT | N | LG: Agree with FL’s assessment  vivo: this can be coordinated between TRPs by implementation.  QC: Agree with FL’s assessment  Ericsson: Agree with FL’s assessment.  Samsung: Agree with FL and we also think that it can be operated by current specification.  Huawei/HiSilicon: Agree with FL’s assessment.  Intel: Agree with FL, this is an old issue that was not supported.  CATT: Agree with FL. |
| MT.4 | The issues of QCL collision of different channels/signals:  Issue 1: PDCCH and PSDSCH of different TRP:   * vivo (R1-2100417) proposed to conclude that PDSCH and PDCCH for different TRP shall not overlap   Issue 2: QCL of PDSCH and SSB on the same symbol:   * Apple (R1-2101349) proposed to clarify that in mTRP system, the gNB should ensure at least one DMRS port and SSB are QCLed, Instead of all the DMRS ports. Because one PDSCH could be indicated with two TCI state in mTRP.   Issue 3: PDCCH monitoring priority rule in M-DCI mTRP:   * Ericsson (R1-2101690) proposed that for the PDCCH monitoring priority rule based QCL-TypeD in multi-DCI based M-TRP, apply the priority rule within CORESETs with same CORESETPoolIndex for a UE capable of two simultaneous QCL-TypeD * Intel (R1-2100633) proposed to extend PDCCH prioritization based on QCL Type D properties to multi-DCI multi-TRP operation | vivo, Apple, Ericsson, Intel | H | LG: Issue 1 and 2 can be discussed. Issue 3 has already been discussed in the last RAN 1 meeting and corresponding TP was not agreed.  vivo: agree  QC: Issue 1 is not clear since rate matching and OoO are separate issues (the connection between the two in R1-2100417 is not clear). Issue 2 and 3 can be discussed.  Ericsson: Ok to discuss the issue.  Samsung: We agree with discussing issue 2 only. Issue 1 seems too restricted. Issue 3 was already discussed but cannot make an agreement and we think that Issue 3 can be discussed in Rel-17 multi-TRP PDCCH enhancement.  Docomo: Agree with H.  Lenovo/Mot: Agree to discuss issue 1 and issue 2. Issue 3 can be discussed in Rel-17 ePDCCH.  Huawei/HiSilicon: These are further enhancements. Prefer not to discuss further.  Intel: Prefer to discuss Issues 2, 3    CATT: Agree with FL. |
| MT.5 | The issue of default TCI state for PDSCH in mTRP system:   * vivo(R1-2100418) proposed to specify the default TCI state of PDSCH in mTRP for the following scenarios:   + When the DCI does not have TCI field in S-DCI based mTRP system   + When the DCI indicates only one TCI state in S-DCI based mTRP system   + The mapping of default TCI states for PDSCH of scheme 2a/2b   + Cross-carrier scheduling * Samsung (R1-2101182) propose to specify the default TCI state of PDSCH of cross-carrier in S-DCI based mTRP. * ASUSTeK (R1-2101565) proposed to discuss and clarify the default TCI state of cross carrier scheduling in mTRP systems   FL: was discussed a lot in previous meetings | vivo, Samsung, ASUSTek | N | LG: Agree with FL’s assessment  Vivo: propose H. The default QCL of our listed cases need to be specified otherwise the spec is not complete since default QCL of scheme 3/4 and AP-CSI-RS have been captured.  Samsung: Okay to discuss.  Huawei/HiSilicon: Agree with FL’s assessment.  Intel: Agree with FL, these were discussed multiple times with no conclusion  CATT: Agree with FL |
| MT.6 | The issue of SPS PDSCH transmission in mTRP:   * Samsung (R1-2101182) proposed to include the SPS of scheme 4 in the description of Type-1 HARQ-ACK codebook determination and also proposed to specify the method of receiving two overlapped SPS PDSCHs associated with different TRPs in M-DCI mTRP * Qualcomm (R1-2101441) proposed to clarify that the RV sequence used across multiple repetitions in schemes 2b, 3, and 4 is based on setting rvid=0. Qualcomm (R1-2101441) also proposed TP to specify that Each SPS PDSCH is associated with a CORESETPoolIndex value, and resolving overlap procedures are done within the same CORESETPoolIndex value * Ericsson (R1-2101688) proposed CR to specify the RV values for DL DPSCH SPS in S-DCI mTRP   FL: was discussed in pre-phase in previous meeting and some companies thought that is it is not essential to rel16 and maybe for later release | Samsung, Qualcomm, Ericsson | N | LG: SPS transmission in M-DCI based M-TRP should be high priority as SPS PDSCHs overlapped in time cannot be supported even though a UE has capability receiving different PDSCHs at a given time.  QC: This issue is essential and should be discussed with high priority. If companies think discussing SPS for both single-DCI and multi-DCI does not fit in one Email thread, we are open to discuss one of them only (the issues for single-DCI seem to be more straightforward).  Ericsson: We share the view as Qualcomm. Note that the current spec allows the single DCI based multi-TRP PDSCH repetition schemes to be scheduled with CRC scrambled by C-RNTI, MCS-C-RNTI, CS-RNTI, or PDSCH scheduled without corresponding PDCCH transmission using sps-Config and activated by DCI format 1\_1 or 1\_2. The remaining part for single DCI based multi-TRP is to clarify which RV sequence to use. Without clarifying this further, the current spec is incomplete (i.e., SPS can be triggered via single DCI based multi-TRP but the spec is unclear on which RV sequence to use). Without the change, the current spec is incomplete. So we this this issue is high priority and should be discussed.  Samsung: Suggest changing to ‘H’. SPS is supported already in S-DCI based M-TRP. There’s no reason to exclude SPS for M-DCI based M-TRP only. Also overlapping issue should be resolved and without resolving this issue, overlapping SPS PDSCHs may not be received by the UE even though UE may have declared a capability to receive overlapping DG PDSCHs.  Huawei/HiSilicon: Agree with FL’s assessment.  Intel: We agree that SPS is a valid use-case, but the scope seems quite large for maintenance discussion. |
| MT.7 | The issue of radio link monitoring in mTRP:   * Apple (R1-2101349) proposed to enhance the method of UE determining RLM RS in M-DCI mTRP system by adding Lmax = 8.   FL: was discussed in pre-phase in previous meeting and some companies thought that is optimization for mTRP | Apple | N | LG: Agree with FL’s assessment  Apple: We would like to clarify that this is different from last proposal. If gNB does not know which RSs are selected for BM, gNB cannot know how to count RLM RS in FG 16-1g/16-1g-1. This is an essential issue. We think this can be moved to MT.12, since it just reuses the same approach as 3 CORESET case.  QC: Agree with FL’s assessment  Ericsson: Agree with FL’s assessment.  Samsung: Agree with FL.  Huawei/HiSilicon: Agree with FL’s assessment.  Intel: Agree with FL assessment |
| MT.8 | HARQ transmission/retransmission in mTRP system:   * Apple (R1-2101349) proposed to clarify that in M-DCI system, the UE is not mandated to support receiving PDSCH HARQ re-transmission scheduled by different TRPs. * Apple (R1-2101349) proposed to reach a conclusion on whether support sub-slot based HARQ-ACK when the UE is configured with M-DCI mTRP. * Huawei/HiSi (R1-2101256) proposed to clarify that the DCI for initial and re-transmission of PDSCH of the same TB shall be transmitted in PDCCHs with same CORESETPoolIndex.   FL: it seems that has impact on the UEs using CA architecture to implement mTRP | Apple, Huawei/HiSi, ZTE | H | LG: Agree with FL’s assessment  ZTE: We support discussing this issue as the high priority.  Vivo: Agree with FL assessment.  Apple: Since this has product impact from us, we hope this can be discussed. We are very flexible account the actual solution  QC: We think UE feature may be more suitable to discuss the issue. We are ok to discuss the issue in maintenance as well. In that case, for the first and third bullets (retransmission), the existing behavior (allowing for retransmission across TRPs for reliability use cases) should not be excluded and the solution should be backward compatible. We kindly request to include this point in the scope of discussions if it is decided to discuss this as part of maintenance.  OPPO: We support to discuss this with high priority  Samsung: We can tend to agree in principle, but as Qualcomm mentioned, we prefer to discuss in UE feature session, not in here. We do not think that an restricted operation for a specific implementation cannot be specified. Based on UE feature, it can be restricted. Hence we think it can be changes as ‘N’.  Docomo: The issue can be also avoided by implementation. Otherwise, a new UE capability may be needed. Ok to discuss. But it can have lower priority other than ‘H’.  Lenovo/MOT: Agree with FL assessment.  Huawei/HiSilicon: Agree with FL’s assessment.  MediaTek: We support to discuss this issue. As Apple mentioned, this should be clarified.  Intel: This issue is also prioritized in UE feature list discussion, we can discuss it there.  CATT: Agree with FL’s assessement. However, it’s noted that issue 2 is also under discussion in URLLC maintenance session now. Therefore, it would be better to determine whether this issue should be discussed in MTRP or URLLC.  In addition, we prefer not to discuss this issue in UE feature session in such a late stage. |
| MT.9 | The issue of BFR in S-DCI mTRP system:   * Qualcomm (R1-2101441) proposed to reset the mapping of all TCI codepoints of PDSCH to qnew after BFR in S-DCI based mTRP system.   FL: fallback QCL of PDSCH in BFR was discussed extensively in MB session in both rel15/16 | Qualcomm | N | LG: Agree with FL’s assessment  QC: This item is essential in our view. This is related to the new behavior that is introduced in sDCI based mTRP wrt default beams. Hence, Rel. 15/16 discussions in multi-beam are unrelated / irrelevant to this. The note from FL seems to be not based on the proposal in R1-2101441.  Ericsson: we understand the issue raised in R1-2101441. Given BFR for m-TRP is being discussed in Rel-17, may be this is something we can discuss in Rel-17?  Samsung: Agree with FL.  Lenovo/MOT: Agree with FL assessment.  Huawei/HiSilicon: Agree with FL’s assessment.  CATT: Agree with FL. |
| MT.10 | M-DCI mTRP in NR-DC:   * Qualcomm (R1-2101441) proposed to clarify BD/CC limit in the presence of NR-DC in M-DCI based mTRP system   FL: was discussed in pre-phase in previous meeting and comments said that it is not essential issue | Qualcomm | N | LG: Agree with FL’s assessment  QC: The behavior for multi-DCI and NR-DC is not defined in the current spec.  Samsung: Agree with FL.  Huawei/HiSilicon: Agree with FL’s assessment.  CATT: Agree with FL. |
| MT.11 | Support out-of-order operation within a slot:   * CATT (R1-2100340) proposed to update 38.214 to support out-of-order of PDSCH from different TRPs within a slot: description in current 38.214 only supports out-of-order PDSCH across slot, the TP is given:     FL: was discussed in pre-phase in previous meeting and it looks like an optimization | CATT | N | LG: Agree with FL’s assessment  Samsung: Agree with FL.  Huawei/HiSilicon: Agree with FL’s assessment.  CATT: This issue has not been discussed formally in previous meeting |
| MT.12 | Editorial change on mTRP (some needs discussion on the necessarity of the change):   * ZTE (R1-2100281) proposed to delete “[subject to UE capability]” in 7.3.1.2.2 of 38.211. * ZTE (R1-2100281) proposed TP to capture missed part of “the 1st PDSCH transmission occasion” of one agreement on scheme 3 and 4 in Section 5.1.5 of 38.214. * ZTE (R1-2100281) proposed to remove the “when sequenceOffsetforRV is present” from the Caption of Table 5.1.2.1-3 in 38.214 because it is not necessary. * Vivo(R1-2100417) proposed to add “*If a UE is not provided ackNackFeedbackMode = separate*,..” in Section 9.2.3 of 38.213 to avoid confusion to the readers. * LGE (R1-2100617) proposed TP for Section 5.1.5 of 38.214 to clarify that if a UE does not support rel16 per-TRP default TCI state, the UE shall apply the default TCI state of rel15 on mTRP PDSCH transmission. * CATT (R1-2100340) proposed that in Section 5.1.2.1 of 38.214, we shall use a separate table to describe the RVs for PDSCH of scheme 4. * CATT (R1-2100340) proposed TP to correct a terminology (“transmission occasion”) in Section 5.1.2.1 of 38.214. * CATT (R1-2100340) proposed to add “,” before “only when” in Section 5.1 in 38.214 to avoid misunderstanding. * CATT (R1-2100340) proposed to add “*if a UE is not provided ackNackFeedbackMode = separate*,..” in Section 9.2.3 of 38.213 to avoid confusion to the readers. * Ericsson (R1-2101691) proposed TP for Section 5.1.5 of 38.214 to clarify that it is “and at least one TCI codepoint *activated by the activation command in 6.1.3.24 of [10, TS38.321]*” * Intel (R1-2100634) proposed CR for Section 5.1.2.3 of 38.214 to clarify that when counting even or odd PRGs in FDMSchemeA or FDMSchemeB, the PRGs are numbered continuously in increasing order with the first PRG index equal to 0. | ZTE, vivo, LGE, CATT, Ericsson, Intel | H | LG: Ok to discuss  QC: Ok to discuss.  OPPO: support to dicuss  Ericsson: Support to discuss the issue with high priority.  Samsung: Agree with FL’s assessment.  Docomo: Agree with H.  Lenovo/MOT: Agree to discuss.  Huawei/HiSilicon: Agree with FL’s assessment for some selected TPs.  Intel: Ok to discuss  CATT: Agree to discuss these issues. |
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| MU.1 | The term in UCI group 1 can be negative  FL: The issue is present for some configurations that lead to small K^NZ value. The proposal is an optimization and can be avoided by proper codebook configuration | Huawei/HiSi | N | LG: Agree with FL’s assessment  ZTE: Agree with FL. Further, K\_NZ should be equal to or larger than rank, which makes the cases with negative values very few.  QC: Agree with FL assessment. It can be avoided by proper codebook configuration.  Samsung: agree with the FL, this issue has been discussed, is an optimization, not essential, can be avoided by proper codebook configuration  Docomo: Agree with N. This issue can be avoided by proper codebook configurations.  Huawei/HiSilicon: Although the UE can interpret that those parameters are mis-configuration, there are too many invalid cases for the first two parameter combinations for rank 3 and 4. For example, 10 (N3 from 3 to 10) out of 17 (N3 from 3 to 19) configurations are invalid for paramCombination-r16=1, in which.  Intel: Agree with FL |
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| UL.1 | Clarification relative phase(s) among Tx ports for non-coherent and partial-coherent UEs.  FL: It has been discussed in past several meetings | ZTE | N | LG: Agree with FL’s assessment. This issue has been discussed for past several meetings, and failed to reach consensus.  ZTE: We believe this issue should be High priority (H), or at least be H2. Although this issue has been raised many times in previous meetings, it has NOT yet been formally discussed. As per our view, it is essential to enhance the clarity of the current specs based on the following considerations.   * In current specs, the full-coherent TPMIs are allowed to be indicated to non/partial-coherent UE to implement Mode 1 based UL full Tx power.   + From the perspective of gNB, it will assume that the relative phase of the full-coherent TPMIs can be ensured by the non/partial-coherent UE and its maximum Tx power can be 23dBm. Correspondingly, gNB may configure such power control parameters of  (RB number) and  (MCS level) based on the maximum Tx power with 23dBm.   + From the perspective of the non/partial-coherent UE, it can NOT ensure the relative phase for the Mode 1 full-coherent TPMIs in practice, which means the actual maximum Tx power is NOT 23dBm.   Therefore, from the perspective of specs, it is essential to keep the alignment between gNB and the non/partial-coherent UE that the relative phase among non-coherent Tx ports is random/uncontrolled.  Vivo: Agree with FL’s assessment.  Apple: We are fine to discuss this issue which has been raised multiple times if scope permits. This can also clarify the UE behavior.  QC: Agree with FL’s assessment.  OPPO: Agree that this should be “N”. The same topic was discussed several times and no consensus was achieved to support the modification. The current spec is sufficient.  Ericsson: **We agree with ZTE that port coherence should be clarified for Mode 1, but the priority of this issue compared to other MIMO sub-topics is not clear at this stage.** While this issue has been raised for several meetings, it has not really been discussed, since higher priority items were covered instead. Then within the scope of UL full power, this issue should be ‘H’. However, its relative priority to multi-trp, multibeam, and mu-csi may need to be checked depending on the outcome of those sub-topics. In case this issue again is not sufficiently high priority, we think it can still be raised at a later meeting.  Samsung: agree with the FL  Docomo: Agree with N  Huawei/HiSilicon: No need to discuss again.  Intel: Agree with FL’s assessment. |
| UL.2 | Clarification on TPMI group signaling for mode 2  FL: It may require some discussion on 4tx UE reporting 2-port {2-bit bitmap} only | Samsung | H | LG: Agree with FL’s assessment.  ZTE: Ok to discuss for clarification.  Vivo: Agree with FL’s assessment.  QC: Not essential. This should be demoted.  OPPO: It shall be “N”. The same wording was discussed in UE feature session and finally RAN1 agreed another version that is captured in the current TS 38.306. The spec of TS 38.306 and TS 38.331 is clear and no ambiguity is seen here  Ericsson: **Similar view as FL, but think that this can be H2 if a minor change (capitalization) to the proposal in R1-2101183 can be made.** Agree that the 38.306 spec is not clear on the subsets of *twoPorts-r16*, *fourPortsNonCoherent-r16*, and *fourPortsPartialCoherent-r16* that can be reported. However, this is quite straightforward to fix, and Samsung’s proposal in R1-2101183 solves the problem. A minor comment is that the ‘g’s used to designate TPMI groups should all be lower case in the 38.306 description, so this should be fixed in Note 2 as well.  Samsung: agree the FL, this clarification is necessary  Huawei/HiSilicon: Should be N. The TP is wording optimization, so we do not think it is needed. If companies think it should be discussed, it should be in RAN2, not in RAN1.  MediaTek: OK to discuss for clarification  Intel: Not essential issue. Same view as OPPO. |
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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 X issues can be handled as E (a part of editorial CR): ...
* The following Y issues can be designated as H2 (editorial TPs that can be agreed without further email discussion, including capturing previous agreements): ...
* The following Z issues can be designated as H (requiring discussion and additional agreements/conclusions): ...

In light of the above observations, the moderator makes the following **proposals**:

* On E-rated issues (...), prepare draft CRs in Appendix A ...
* On H2-rated issues (...), prepare draft CRs in Appendix B ...
* On H-rated issues (...), continue discussion on 4 threads:
  + Thread 1 (moderator Jiwon) Maintenance and TPs for Multi-beam 1: ...
  + Thread 2 (moderator Yushu) Maintenance and TPs for Multi-beam 2: ...
  + Thread 3 (moderator Li) Maintenance and TPs for Multi-TRP: ...
  + Thread 4 (moderator Rakesh) Maintenance and TPs for UL Full-Power: ...

# Appendix A: Draft CRs for E-rated issues

Draft CR ....

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# Appendix B: Draft CRs for H2-rated issues

Draft CR

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# References

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| 1 | R1-2100113 | Text proposals for default close loop index for different TRPs | OPPO |
| 2 | R1-2100114 | Text proposals for overlapping between uplink signals | OPPO |
| 3 | R1-2100115 | Text Proposals for Multi-beam Operation Enhancement | OPPO |
| 4 | R1-2100279 | Maintenance of multi-beam operation | ZTE |
| 5 | R1-2100280 | Draft CR on UL full power transmission Mode 1 | ZTE |
| 6 | R1-2100281 | Maintenance of Multi-TRP enhancements | ZTE |
| 7 | R1-2100298 | Maintenance on multi-TRP transmission | Lenovo, Motorola Mobility |
| 8 | R1-2100339 | Corrections to multi-beam operation | CATT |
| 9 | R1-2100340 | On remaining issues of multi-TRP/panel transmission | CATT |
| 10 | R1-2100416 | Maintenance on multi beam related issues | vivo |
| 11 | R1-2100417 | Maintenance on multi TRP | vivo |
| 12 | R1-2100418 | Maintenance on default QCL issues and multi TRP | vivo |
| 13 | R1-2100617 | Draft CR on multi-TRP/panel transmission | LG Electronics |
| 14 | R1-2100633 | Correction for multi TRP PDCCH prioritization | Intel Corporation |
| 15 | R1-2100634 | Draft CR for clarification of scheme 2a/2b | Intel Corporation |
| 16 | R1-2101180 | On maintenance of Rel.16 multi-beam operation | Samsung |
| 17 | R1-2101182 | On Rel.16 multi-TRP/panel transmission | Samsung |
| 18 | R1-2101183 | On UL full power transmission | Samsung |
| 19 | R1-2101256 | Remaining issues for multi-TRP in Rel-16 | Huawei, HiSilicon |
| 20 | R1-2101271 | Corrections on Type II CSI reporting in Rel-16 | Huawei, HiSilicon |
| 21 | R1-2101272 | Corrections on Scell BFR in Rel-16 | Huawei, HiSilicon |
| 22 | R1-2101349 | Remaining issues on Rel-16 Multi-TRP enhancement | Apple |
| 23 | R1-2101441 | Remaining Issues on Multi-TRP Enhancements | Qualcomm Incorporated |
| 24 | R1-2101565 | Interoperation between cross-carrier scheduling and multiple TRPs | ASUSTeK |
| 25 | R1-2101688 | Draft CR on DL SPS based PDSCH repetitions | Ericsson |
| 26 | R1-2101690 | Maintenance for multi-DCI based multi-TRP in Rel-16 | Ericsson |
| 27 | R1-2101691 | Maintenance for single-DCI based multi-TRP in Rel-16 | Ericsson |
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