**3GPP TSG RAN WG1 #102-e R1-200xxxx**

**e-Meeting, August 17th – 28th, 2020**

**Agenda item:** 7.2.6

**Source:** Moderator (Samsung)

**Title:** Revised moderatorsummary 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 six 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 Aug 17th thereby not counted toward the six-thread quota)
* *Non-essential (N)*: this includes all other purposes such as spec optimization and low priority issues
1. Maintenance issues

The issues are summarized in the following table:

Table 1 Summary of issues

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **#** | **Issue (summary)** | **Companies** | **Initial assessment** | **Company inputs (if any)** |
| LP.1 | When Pi/2 BPSK is used for the PUSCH transmission, i.e., *DMRSuplink-r16* in the *DMRS-UplinkConfig* IE is provided, different DMRS sequence  is generated on different DMRS ports associated with different CDM group $λ$. The specification in clause 6.4.1.2.1.1 of TS 38.211 does not clearly specify  for a PTRS port  or  is based on which CDM group. | Qualcomm | N |  |
|  |
| MB.1 | Specify the pathloss RS for PUSCH scheduled by DCI format 0\_2Note: Missing piece to enable the default PLRS for PUSCH scheduled by DCI 0\_2 | Support: OPPO, DOCOMO, ZTE, Apple, LGE, Apple, MediaTek, Nokia/NSBConcern: Ericsson | [H] | DOCOMO: this is a missing case of the previous agreement, and we suggest to categorize as H2 (i.e. ready for endorsement by Aug 17th), because there is nothing special to discuss from technical perspective.Ericsson: new functionality – should be NApple: We are okay to discuss thisNokia/NSB: We are fine to discuss this.MediaTek: Support to discuss this. |
| MB.2 | Support enabling default PL RS in FR1Note: Proposed in multiple meetings but couldn’t have chance to be discussed | Support: Huawei/HiSi, Qualcomm, Ericsson, ZTE, Lenovo/MotMConcern: OPPO, Apple, Intel, MediaTek | N | OPPO: that is not essential issue. The feature of default PL RS is because of the default beam operation in FR2. In contrast, in FR1, there I no default beam, then why we need “default PL RS” for FR1. Furthermore, the agreed UE feature 16-1c (default pathloss RS) is FR2 only.Intel: This is useful change but seems not essential correction. Apple: We do not think we need to discuss it since it is clarified in the UE feature discussion that the related capability reporting is only for FR2, i.e., FG16-1c default PL is only limited to FR2Lenovo/MotM: Ok to support default PL RS for FR1. The default PL RS can be SSB used for the most recent random access procedure (excluding PDCCH order).Nokia/NSB: We consider this CR as a thing good to have.Huawei/HiSilicon: Support it to be discussed. We think enabling this feature in FR1 is essential for multi-beam systems in FR1. Note that RAN#88 recently approved R15 CRs to enable 8 SSBs for 2.3~2.4 GHz TDD bands (RP-201348).MediaTek: Don’t support. We have the similar view as OPPO and Apple. |
| MB.3 | [Editorial] Align the RRC parameter names with the latest TS 38.331. TP2-TP8 from ZTE  | ZTE, Nokia/NSB, DOCOMO, Ericsson, Apple, Sony | H2 | ZTE: In the current TS 38.214, it is incorrectly specified that the set of CCs/BWPs, i.e., applicable list of CC, is indicated by RRC rather than by MAC-CE. This is also an editorial issue, and so we recommend to replace “N” by “H2”, or to combine this MB5 into MB.3. |
| MB.4 | Support the feature of simultaneous spatial relation update across multiple BWPs/CCs when default spatial relation for SRS is enabledNote: Unresolved issue from the last meeting, priority is unclear | Support: Vivo, Sony. Not support: LGE, ZTE, Apple | N | Qualcomm: This is a remaining issue from last meeting. Support to continue discussion. Intel: This is useful change but seems not essential correction.ZTE: This issue can be considered in Rel-17 unified TCI architecture for multi-CC case.Apple: We do not think we need to discuss it since it was discussed in the last meeting.Nokia/NSB: We support this issue to be discussed. We may fix this issue with very small modification and the modification would be aligned with what we did for similar issues. |
| MB.5 | [Editorial] Clarify that RRC can provide two CC lists and the applied CC list is determined by the MAC-CE. TP1 from ZTENote: The current spec may already be clear | Support: ZTE (N should be H2)Concern: OPPO | N | ZTE: In the current TS 38.214, it is incorrectly specified that the set of CCs/BWPs, i.e., applicable list of CC, is indicated by RRC rather than by MAC-CE. This is also an editorial issue, and so we recommend to replace “N” by “H2”, or to combine this MB5 into MB.3.OPPO: we do not think the TP1 from ZTE is needed. The section 6.1.3.14 in 38.321 does clearly explain how to apply the CC lists, which is copied below for reference. Therefore, there is no issue in current description of 214. Suggest to remove TP1:**From 38.321:**-     Serving Cell ID: This field indicates the identity of the Serving Cell for which the MAC CE applies. The length of the field is 5 bits. If the indicated Serving Cell is configured as part of a *simultaneousTCI-UpdateList1-r16* or *simultaneousTCI-UpdateList2-r16* as specified in TS 38.331 [5], this MAC CE applies to all the Serving Cells configured in the set *simultaneousTCI-UpdateList1-r16* or *simultaneousTCI-UpdateList2-r16*, respectively;ZTE2: @OPPO Glad to see that we are on the same page about this framework. But, please review the following paragraphs in RAN1, which incorrectly implied that the indicated CCs is provided by RRC rather than MAC-CE. Thus, this TP is just an alignment one to prevent the potential ambiguities between RAN1 and RAN2 spec.In TS 38.214When a *spatialRelationInfo* is activated/updated for a semi-persistent or aperiodic SRS resource configured by the higher layer parameter *SRS-Resource* by a MAC CE for a set of CCs/BWPs, where the applicable list of CCs is indicated by higher layer parameter *simultaneousSpatial-UpdatedList-r16* or *simultaneousSpatial-UpdatedListSecond-r16*,, the *spatialRelationInfo* is applied for the semi-persistent or aperiodic SRS resource(s) with the same SRS resource ID for all the BWPs in the indicated CCs. |
| MB.6 | Exclude multi-TRP CC from the simultaneous TCI state activationNote: Motivation seems unclear | Support: OPPO, LGE, Sony, Nokia/NSB | H | OPPO: The current specification allows to configure CC of multi-TRP in the CC list for simultaneous PDSCH TCI state activation. But that cannot be supported and there are lots of unresolved issues if we support it.. A few examples of the issues:* CC1 and CC2 are configured in the CC list. CC1 is single-TRP but CC2 is multi-DCI based multiTRP CC. When MAC CE in CC1 activates 8 PDSCH TCI states, then how to apply those activated TCI state IDs on CC2? Shall they be applied to PDSCH corresponding to which TRPs or both TRPs.
* What if CC1 is single-DCI based multiTRP but CC2 is multi-DCI based multi-TRP?

Furthermore, in the agreement on PDSCH TCI activation, it is stated to apply to single-TRP case:**Agreement**When a set of TCI-state IDs for PDSCH are activated by a MAC CE for a set of CCs/BWPs at least for the same band, where the applicable list of CCs is indicated by RRC signalling, the same set of TCI-state IDs are applied for the all BWPs in the indicated CCs.* Further signaling details are up to RAN2.
* Whether to support the inter-band CA for this feature will be decided in RAN1#99.
* Whether to indicate the applicable list of bands for the feature of single MAC-CE to activate the same set of PDSCH TCI state IDs for multiple CCs/BWPs is up to capability discussion.
	+ FFS on the UE capability signaling details
* Note: This at least applies to single TRP case.
* FFS: How many combinations of CCs can be configured by RRC and relevant UE capability

Therefore, the current specification shall be revised to exclude that configuration.LG: We are open for discussing this to align RAN1’s understanding but our understanding of current TS38.321 is that the same set of TCI state IDs are activated for both CORESET pools if a CC with two CORESET pools is included in a CC list (See yellow part below), meaning that MTRP + Multi-CC TCI is already functional.**< TCI States Activation/Deactivation for UE-specific PDSCH MAC CE >**- CORESET Pool ID: This field indicates that mapping between the activated TCI states and the codepoint of the DCI *Transmission Configuration Indication* set by field Ti is specific to the *ControlResourceSetId* configured with CORESET Pool ID as specified in TS 38.331 [5]. This field set to 1 indicates that this MAC CE shall be applied for the DL transmission scheduled by CORESET with the CORESET pool ID equal to 1, otherwise, this MAC CE shall be applied for the DL transmission scheduled by CORESET pool ID equal to 0. If the *coresetPoolIndex* is not configured for any CORESET, MAC entity shall ignore the CORESET Pool ID field in this MAC CE when receiving the MAC CE. If the Serving Cell in the MAC CE is configured in a cell list that contains more than one Serving Cell, the CORSET Pool ID field shall be ignored when receiving the MAC CE.Nokia/NSB: We support to discuss this issue in M-TRP sessionSony: We are also open to discuss this issue. It might be necessary to correctly capture UE’s behaviour in RAN1’s spec according to above agreement, when this cross-CC TCI states updating for PDSCH happens. |
| MB.7 | Support the feature of default spatial relation/PL RS for multi-DCI based MTRPNote: late optimization for Rel-16, many impacts on spec as well as UE features | Apple, Lenovo/MotM | N |  |
| MB.8 | Clarification on measurement restrictionDefine the measurement restriction for L1-SINR, where* For two report settings, *timeRestrictionForChannelMeasurements* defines the measurement restriction for CMR, and *timeRestrictionForInterferenceMeasurements* defines the measurement restriction for dedicated IMR.

For one report setting, *timeRestrictionForChannelMeasurements* defines the measurement restriction for CMR, and *timeRestrictionForInterferenceMeasurements* defines the measurement restriction for interference measurement based on the same resources for CMRNote: Based on previous conclusion and should not take too much effort, also have impact on RAN4’s work | Support: vivo, Futurewei, AppleConcern (H should be N): Qualcomm, Ericsson, ZTE, Lenovo/MotM, Sony | N | FUTUREWEI: we assume here “report setting” should be “resource setting”. Ok to discuss but assume the behavior should be the same for other type of CSI report.Qualcomm: Non-essential. The RAN1 #99 conclusion means no further discussion on this topic. UE can apply same rule for CQI to L1-SINR, no ambiguity. There are many similar issues not clarified.Ericsson: The statements in 5.2.1.1 applies to all types of reports ZTE: Share the same view with QC. Lenovo/MotM: Non-essential. Share the same view with QC.Nokia/NSB: This issue should have minor priority. We agree on the benefits of modification, but seems not essential. vivo: would like to respond to the comments from companies, the intention is to clarify the behavior for one resource setting associated with L1-SINR. For such configurations, the same resource is used for both channel measurement and interference measurement. Then is it allowed behavior that for channel measurement there is no measurement restriction, but for the interference part there is measurement restriction or vice versa? This may also involve some UE feature discussion on how to count the resources if computation are different for channel part and interference part. Such behavior may need official discussion to align companies understanding.Sony: similar view with Qualcomm. |
| MB.9 | QCL assumption for CMR without QCL indicationOne of the following changes can avoid the ambiguity.* UE considers the case as an error case
	+ One way to clarify the ambiguity is considering it as an error case.
* Extending the current UE behavior
	+ According to the current specification, when a UE is configured with two Resource Settings for L1-SINR, the UE can apply same QCL-TypeD assumption for CMR resource and the corresponding IMR resource. We may extend the current UE behavior to this case.

Note: UE behavior is unclear if QCL-TypeD for CSI-RS is not provided for both CMR and IMR, but this looks to be a general issue for P-CSI-RS | Support: Interdigital, Huawei/HiSi, OPPO, AppleConcern (H to N): Ericsson, LGE, Samsung, ZTE, NTT DOCOMO, Qualcomm, MediaTek, Sony, Nokia/NSB  | N | FUTUREWEI: This is related to the RAN4 LS R1-2006952 on scenarios of P1 CSI-RS without QCL. Also not clear whether the issue is only for QCL-TypeD or more generalQualcomm: Non-essential. If no QCL indicated, UE can use the PO beam to receive. Same as for SSB. No new rule is needed.DOCOMO: Non-essential. We don’t understand why this scenario happens (i.e. why gNB does not indicate QCL for CMR). Ericsson: this needs to be addressed in a more general setting.Samsung: Non-essential. Current specification clearly says that QCL-D assumption of IMR follows that of CMR. It seems a misconfiguration if CMR doesn’t provided QCL-D while IMR does, which doesn’t need to be specified.ZTE: Postpone this discussion. It is relevant to the final RAN1 conclusion/reply to RAN4 LS R1-2006952.Apple: we support to discuss it. This is similar issue in LS R1-2006952LG: Non-essential. To our understanding, CMR with no QCL source could happen from Rel-15 so no special treatment for L1-SINR seems needed.Nokia/NSB: Not support. Sharing similar view with LGEHuawei, HiSilicon: we support it to be discussed.MediaTek: Non-essential, we have the same views as Qualcomm, DOCOMO, Samsung, LG, and Nokia/NSB.Sony: same view with DOCOMO that it seems unreasonable for NW not to indicate QCL to CMR. |
| MB.10 | Various editorial issues (TP): See Appendix ANote: Obviously needed, not controversial | Apple. MTK, Sony, ZTE, APT, Ericsson  | H2 |  |
| MB.11 | L1-SINR report without dedicated IMRFor CMR without IMR, define the interference should be measured based on total received power on dedicated CSI-RS resource for channel measurement excluding the power of the NZP CSI-RS corresponds to interference and noise.Note: There should be legacy UE behavior for SINR measured with CMR only. In Rel-15, SS-SINR/CSI-SINR is defined with CMR only. | Support (N to H): MediaTek, Samsung, LGEConcern: Ericsson, Sony | N | Samsung: Suggest changing to H. Regarding note - Although there is legacy UE behavior in Rel-15, it isn’t for L1-SINR. Current 214 specification lacks description on L1-SINR measurement on CMR only.LG: Share the view with Samsung. Support to discuss this for better clarity of the specification.Ericsson: The legacy UE behavior applies. We also have the related (although not identical) agreement from RAN1#98bis:ConclusionHow to measure interference for L1-SINR from configured ZP/NZP IMR resources is up to UE implementation.MediaTek: We have the same views as Samsung and LG. We already defined the UE behavior when L1-SINR with dedicated IMR is configured in the above conclusion. The UE behavior for L1-SINR report without dedicated IMR should be also defined in 28.214.Sony: Though the proposed clarification depict one way for UE to handle CMR for both signal and interference parts, as mentioned in above Conclusion, it can be left for UE implementation. |
| MB.12 | QCL for IMR:The agreed behavior that the QCL for IMR is based on that of CMR should exclude the case when aperiodic L1-SINR is triggered and the report setting is associated with periodic/semi-persistent CSI-RSNote: According to previous agreement, gNB should avoid the case that one CSI-RS would be with two different QCL assumption | vivo | N | Nokia/NSB: We agree on the possible problems, but it would be solved by gNB’s proper management. Spec change would not be needed. |
| MB.13 | NZP+ZP IMR:There are two alternatives:* Alt1: Add the restriction that all CMR should be QCLed w.r.t ‘QCL-TypeD’ if both NZP IMRs and ZP IMR are configured.
* Alt2: Remove NZP+ZP based interference measurement

Note: Already discussed for a few meetings without much consensus | Alt1. Huawei/HiSiAlt2. LG, Apple  | N | Apple: we should reach a solution and we prefer to remove CMR + NZP-IMR + CSI-IM from the specification, It is also related to the UE feature discussion, we are likely not to have capability defined for this configuration and, if that is the case, the corresponding specification should be removed |
| MB.14 | Scheduling restriction for NZP IMR:In L1-SINR measurement, if the CMR is associated with a *NZP-CSI-RS-ResourceSet* with parameter *repetition* set to 'on', both the CMR and the associated IMR cannot be configured over the symbols during which the UE is also configured to monitor the CORESET.Note: According to some comments in last meeting, this seems to be a RAN4 issue. | Huawei/HiSi | N |  |
| MB.15 | EPRE for L1-SINR: When L1-RSRP is measured by NZP CSI-RS, UE should not compensate the L1-RSRP by the associated EPRE parameters.Note: Submitted last meeting, conclusion was no further discussion in Rel.15/16 | Qualcomm  | N | Samsung: This issue was submitted in previous meeting for Rel-15 CR and rejected (categorized ‘rejected’ in [101-e-NR-7.1CRs-14] implying that there would be no further discussion in Rel-15/**-16**) |
| MB.16 | BWP for CORESET #0 beam reset by RACH:In case of CORESET 0 beam updated by RACH, the updated beam is applied to CORESET 0 in all BWPsNote: Submitted last meeting, conclusion was no further discussion in Rel.15/16 | Qualcomm | N | Samsung: This issue was submitted in previous meeting for Rel-15 CR and rejected (categorized ‘rejected’ in [101-e-NR-7.1CRs-14] implying that there would be no further discussion in Rel-15/**-16**) |
| MB.17 | PUCCH/PDCCH Beam after CBRA-BFR for PCell/PSCell BFR* During contention-based BFR, if Msg.3 or Msg.A of CBRA-BFR contains BFR MAC CE, the UE shall transmit PUCCH using the spatial filter which is used for the PRACH transmission, until reconfigured/reactivated by the gNB.
* During contention-based BFR, if Msg.3 or Msg.A of CBRA-BFR contains BFR MAC CE, the UE shall monitor PDCCH in all CORESETs using QCL assumption of SSB index selected for the PRACH transmission.

Note: Although a number of companies would like to discuss this, it has been pointed out that this item is out of scope since it is not related to SCell BFR (cf. Rel.16 WID). Perhaps this is less controversial as a proposal for Rel.15 maintenance in RAN1#103-e. | Support (N to H): Docomo, Ericsson, Nokia/NSB, Qualcomm, ZTE, Apple, MediaTekConcern: Sony, Huawei/HiSi | N | Qualcomm: This is for SpCell BFR with BFR MAC-CE introduced in R16 in RAN2, so it is not out of scope. DOCOMO: We believe this is a prat of scope because BFR MAC CE in Rel.16 first enables to distinguish CBRA for BFR and other purposes (e.g. UL in sync., HO, etc.), and it enables to define QCL assumption after CBRA-BFR. Also, without this modification, CBRA-BFR does not work well, and hence this is essential.Ericsson: We are in maintenance phase, nothing is out of scope. Important issue for CBRA BFR, also discussed in R15 maintenance as well.ZTE: We can support further discussion for spatial relation update for PUCCH but not for CORESET. In our view, the motivation for further clarifying UE QCL assumption for CORESET after receiving Msg3 or MsgA is unclear.Apple: CBRA seems to be a lingering issue. We are actually fine to discuss it.Nokia/NSB: We are handling practical and significant issue here which impacts SCell BFR. Not out of scope.Huawei HiSilicon: We share the similar view with Moderator, it is out of scope, since the scope is for Scell BFR for Rel-16 in WID. RAN2’s discussion also should be in the scope of WID. MediaTek: We are fine to discuss.Sony: In our view, the SpCell BFR reusing MAC CE (originally designed for SCell BFR) seems out of RAN1’s scope. So we would like to mark it as ‘N’ |
| MB.18 | BFD RS monitoring behavior:If explicit BFD is configured before SCell fails, UE should stop monitoring the previously configured explicit BFD RS(s) after receiving the response for the step-2 MAC-CE* UE can start implicit BFD after receiving TCI activation/reconfiguration for failed SCell

Note: Submitted last meeting, conclusion was no further discussion in Rel.15/16 | Qualcomm  | N | Qualcomm: From our RAN2 folks, it does not belong to RAN2, because all BFD monitoring behavior is captured in RAN1 spec. Prefer not to direct back and forth. Samsung: This issue was submitted in previous meeting for Rel-15 CR and rejected (categorized ‘rejected’ in [101-e-NR-7.1CRs-14] implying that there would be no further discussion in Rel-15/**-16**)Nokia/NSB: We do not sure whether spec change is needed. |
| MB.19 | Clarification of SSB for BFD: Clarify whether SS/PBCH blocks can be provided for BFDNote: According to a previous agreement, SSB cannot be used for SCell BFD. Rel-15 CR seems to be a better place to clarify SSB for PCell/PSCell BFD | CATT | N |  |
|  |  |
| MT.1 | Issue 1: Closed-loop Power control for multi-DCI based related with Out-of-order operation：* As described in the note of FG 16-2a-3, the UE supporting out-of-order UL operation does not support same closed loop index for PUSCH associated with different TRPs. But in current specification, in some cases for example when all the PUSCH using default closed loop power index use the same closed loop index. That cause issues. Furthermore, the UE behavior with that note seems not clear, as suggested by ZTE [6].
* ZTE [6] proposed to specify in TS 38.213 that if the UE supports out-of-order, the UE expects to be configured with different l values for PUSCH scheduled by different TRP.
* OPPO [15] proposed to clarify in TS 38.213 that the default loop index for PUSCH/PUCCH associated with CORESETPoolIndex = 1 is l = 1.

Issue 2: PDCCH prioritization based QCL-TypeD for PDCCH in Multi-DCI based transmission* ZTE[6] proposed to support two QCL-TypeD for PDCCH reception at a given time in M-DCI.
* Intel [14] proposed to extend the PDCCH prioritization based on QCL-TypeD to M-DCI multi-TRP operation.
* Ericsson [36] proposed that PDCCH QCL-TypeD priority rule is applied within CORESETs from the same TRP for the UE supporting two simultaneous QCL-TypeDs.
* Qualcomm [41] proposed that in M-DCI based multi-TRP, priority rules shall be defined within CORESETs within the same TRP.
* Nokia [45] proposed that for a UE capable reception of two different QCL-TypeD, the PDCCH monitoring priority rule based QCL-TypeD apply within CORESETs with the same CORESETPoolIndex.

Issue 3: Collision between QCL-typeD of PDCCH and default QCL of PDSCHNote: The UE could meet difficulty to support uplink out-of-order operation due to the note added in FG 16-2a-3 and the current specification on closed loop power control index. | Issue 1:Support: ZTE, Intel, Huawei/HiSiConcern: Futurewei, Qualcomm, Ericsson, OPPO, Lenovo/MotM, Samsung, LG, MediaTek Issue 2:Support: ZTE, Intel, Ericsson, Qualcomm, Nokia/NSB, OPPO, Lenovo/MotM Concern: Futurewei, Samsung, LG, MediaTekIssue 3:Support: Qualcomm, Apple,Concern: Futurewei, Samsung, LG, MediaTek, OPPO | N | FUTUREWEI: it is not clear what exact the issue intended here. It may help to list the related contributions.Qualcomm: For the first issue (closed loop power control), the note is related to UE capability discussion. We do not see any specification impact in 38.213 due to the note. Hence, we do not agree that the first issue is “H”. For the second issue (QCL-TypeD), we are supportive. In addition, this issue is closely related to MT.13 and they should be discussed together. OPPO：The note imposes severe restriction on scheduling of M-DCI based M-TRP, which is not just related to UE capability discussion. For a UE reporting support of FG 16-2a-3, PUSCH/PUCCH associated with different *CORESETPoolIndex* is not supported by UEs without configuration of SRI/PUCCH-spatialrelationifo (which is not needed in FR1). It makes scheduling of M-DCI based M-TRP more difficult for a UE supporting this FG than a UE not supporting it. This issue can be easily solved by using different close loop index for different TRPs, which is straightforward for M-TRP transmission. Intel: Same view as QC that 2 disjoint issues here – first one should not be H. Second one should be H.Ericsson: The first issue (closed loop power control) does not need any specification change in 38.213 as this has been handled as part of UE capability discussion. So, we would like to remove the first issue from high priority list. We support only the second issue to be discussed in this meeting with high priority.Samsung: We think this issue is non-essential. Besides, this issue consists two independent sub-issues which need to be separated.On the first one (closed-loop PC), separate closed-loop per CORESETPoolIndex can be done already via gNB implementation.On the second one (PDCCH prioritization), it’s not related to out-of-order operation. Also, it’s an optimization which can be done in Rel-17.ZTE: The default close loop index is always 0 based on the current spec even out-order -UL is supported. This conflicts with UE feature. In addition, even UE supports out-order-UL, gNB can still configure in-order-UL with the same close loop. These issues should be clarified in the spec. So the power control issue should belong to H.Apple: we can consider MT.13 together with MT.1LG: Non-essential. Regarding closed loop index, current specification is enough. The second issue on different QCL-D PDCCH is obviously optimization and could have many subsequent proposals/issues such as MT.13. gNB can configure TDM PDCCH for different CORESET pool to avoid monitoring skip so current specification is functional. We can optimize this in Rel-17 BM enhancement for MTRP, if needed, but it is not desirable to discuss this in the late CR phase.Lenovo/MotM: We see no specification impact for 38.213 due to the UE capability note for the first issue on CL PC. For the second issue on PDCCH monitoring priority for simultaneous PDCCH with different QCL-TypeD, we support Ericsson/Nokia proposal on applying the priority rule for CORESETs with the same CORESETPoolIndex.vivo: we think issue 2 and issue 3 need to be clarified.Huawei, HiSilicon: We can support MT1 as H but only for the first issue. In our view, the target of MT1 is less clear by targeting at two different issues both of which are linked with ongoing UE cap discussion. For PC for OOO UL, we share similar view with ZTE/Vivo due to newly agreed note of FG 16-2a-3. So it can be prioritized in MT1 right now. But the second issue of PDCCH reception with priority/default can wait until the UE cap is fully settled next week. It can be fixed in RAN1 spec later, if need, so that RAN1 spec discussion can be more efficient by decoupling ongoing UE cap design.MediaTek: Issue 1 is non-essential. Discussion of Issues 2 and 3 can be deferred to later meetings or to R17. |
| MT.2 | PDSCH processing time for URLLCScheme 3Note: missing for scheme 3 in the spec | Support: Huawei/HiSi, Qualcomm, Lenovo/MotM, Apple (view on the issue), MediaTek (view on the issue)  | H | Apple: Based on the current specification, it is based on the first PDSCH occasion. This is the similar issue as scheme 4. The specification is not broken.If we discuss this issue, we need to ensure two things 1. There is no discussion for CAP#2, since there is no related capability
2. The outcome needs to be further relaxation of UE processing compared to the current specification instead of tightening the requirement

Lenovo/MotM: Support need to clarify PDSCH processing time for URLLC scheme 3 ('TDMSchemeA').MediaTek: We have the same view as Apple. Clarification is agreeable, but not any tightening of processing time |
| MT.3 | Various editorial changes (TP): see Appendix B Note: still need discussion, assigning H for this doesn’t imply all the individual TPs are agreed in principle | Support: Vivo, Spreadtrum, Sharp, ZTE, OPPO, CATT, LGE, Huawei/HiSi, Nokia/NSBConcern: Ericsson (this is a grouping of individual single company TPs. Don’t see the need to treat this with high priority unless majority of the companies support this). | H | Qualcomm: For issue MT.3.2, the first sentence of paragraph mentions “Independent of the configuration of *tci-PresentInDCI* and *tci-PresentInDCI-ForFormat1\_2*”, which should be applicable to all parts of the paragraph. From our point, the structure of the paragraph can be enhanced for better readability. Issue MT.3.8 is also in the same category.For issue MT.3.5, spec mentions “UE shall separately apply the procedures described in Clauses 9.1 and 9.2.3 for reporting HARQ-ACK information …” which implies that a single-TRP CC is not considered two times. Even if clarification is needed, it should be captured in the right place. Ericsson: We do not think we should consume one email for addressing these types of editorial TPs. Note that these individual TPs given in the appendix are not proposed by a large number of companies**. Our suggestion is to relegate MT.3 to an N for this meeting.** Some specific comments below:* MT.3.1: Don’t see the need to have a dedicated email discussion for RRC parameter alignment
* MT3.2/MT3.8: Some restructuring of this paragraph in 38.214 may be needed as suggested by Qualcomm. But this doesn’t sound like a high priority at the moment.
* MT3.3: The proposed change is not needed. Note that multi-slot PDSCH is still configured via higher layer parameter SlotBased-r16 according to 38.331 V16.1.0. So current spec is fine.
* MT3.4: Minor clarification. Does not seem like a high priority for this meeting.
* MT3.11: Don’t see the need to have a dedicated email discussion for a typo correction.

Samsung: Okay on its necessity. Further discussion is needed for some TPs. For example, MT3.5 doesn’t mention the case when ACKNACKFeedbackMode is not provided.ZTE: @Qualcomm, for MT 3.5, we fail to see the current spec implies ‘a single-TRP CC is not considered two times’. We are open to discuss which place of 38.213 should be changed. LG: generally fine but we can further discuss priority/necessity TP by TP.Nokia/NSB: It seems that we already have different views here. We are open to discuss the requirement of having suggested TPs.MediaTek: Fine to discuss |
| MT.4 | Default QCL for AP CSI-RS in multi-DCI based M-TRPNote: can be further discussed in future meetings  | Support: vivo, ZTE, Apple, NTT DOCOMO, Qualcomm, Nokia/NSB, Lenovo/MotM, Ericsson, MediaTekConcern: OPPO | [H] | DOCOMO: It is highly possible that AP CSI-RS is used in NW to save signaling overhead, hence default QCL for AP CSI-RS is important.OPPO: Default QCL for AP CSI-RS has been discussed for a long time. We doubt whether it is wise to spend more time on this issue. It can be solved by gNB and UE implementation.Ericsson: We don’t agree with the Note written by the FL. This is proposed by many companies as there is a hole in the specifications when it comes to default QCL for AP CSI-RS that collides with PDSCH(s) that is scheduled by a Multi-DCI based M-TRP. Just because there was no conclusion in the previous meeting, it doesn’t become an optimization! We believe this issue can still be addressed in future RAN1 meetings as part of Rel-16 maintenance. **We suggest to revise the note as ‘Note: can be further discussed in future RAN1 meetings’.**Apple: We think this should be discussed since UE is not expected to support more than two beams, similar as MT. 16Nokia/NSB; Agree with Ericsson. We discussed this one two meetings back, and there is already good background discussion that we could use to finalize this. In that sense, this seems easier case than many others. Suggest (H) for this.vivo: it has been discussed several times and seems many companies have similar proposals on this topic, we can try to promote it to “H”MediaTek: Agree with Ericsson. MT. 4 can be jointly discussed with MT. 16. |
| MT.5 | Default TCI-state for PDSCH of cross-carrier scheduling in multi-DCI based M-TRPNote: optimization | vivo, Qualcomm, Lenovo/MotM | N |  |
| MT.6 | CSI/SR UCI overlapping with two HARQ-ACK PUCCH /PUSCH of two different TRPsNote: can be resolved via implementation | Support: Vivo, SamsungConcern: Nokia/NSB | N | Samsung: Suggest to deal with high priority (H).Current specification allows the case (two HARQ-ACKs overlapping with other UCI) to happen, but corresponding UE behavior is missing.Regarding note, implementation based solution reduces the flexibility for PUCCH scheduling. This is why we have complex overlapping/dropping rules for PUCCH.Nokia/NSB: yes, this can be handled via implementation.vivo: agree with Samsung, it is better to avoid the such overlapping in the spec. |
| MT.7 | Sub-slot based HARQ-ACK feedback in multi-DCI based multi-TRPNote: current spec is clear | vivo | N | vivo: from the current spec, separate HARQ-ACK feedback within a sub-slot is supported, i.e., two PUCCHs within a sub-slot. Is it the correct understanding? |
| MT.8 | PDSCH overlapping with PDCCH from different TRPNote: current spec is clear | vivo | N | vivo: in current spec, if a PDSCH scheduled by a PDCCH would overlap with resources in the CORESET containing the PDCCH, the resources corresponding to a union of the detected PDCCH that scheduled the PDSCH and associated PDCCH DM-RS are not available for the PDSCH. It is impossible for M-DCI based MTRP for non-ideal backhaul scenario for each TRP to know the PDCCH of the other TRP. |
| MT.9 | Active BWP operation in multi-DCI based M-TRP systemNote: optimization | ZTE, Lenovo/MotM, NTT DOCOMO | N | Lenovo/MotM: This is the essential issue for the dynamic BWP switching in multi-DCI based multi-TRP scenario especially for the case that BWP switching are indicated within the same slot by two DCIs with different TDRA values.Nokia/NSB : spec is not broken. |
| MT.10 | SPS transmission in multi-DCI based M-TRPNote: can be further discussed in future meetings  | Samsung, Qualcomm, Ericsson  | N | Qualcomm: We do not agree with the note. This issue is high priority as SPS does not work if 2 values of CORESETPoolIndex are configured. Does the note here mean that SPS is optimization in general?Ericsson: Similar view as Qualcomm. This issue can still be addressed in future RAN1 meetings as part of Rel-16 maintenance. **We suggest to revise the note as ‘Note: can be further discussed in future RAN1 meetings’.**Nokia/NSB: There are other essential corrections that we may have to correct before this. |
| MT.11 | PDCCH BD/CCEs in Multi-DCI based systemNote: can be resolved via implementation  | Spreadtrum, Qualcomm | N | Qualcomm: Clarification regarding the note here is needed. We appreciate it if it can be explained how the issue (for dual connectivity) can be resolved via implementation. |
| MT.12 | Radio link monitoring in multi-DCI based M-TRPNote: optimization | Apple, NTT DOCOMO | N |  |
| MT.14 | Out-of-order operation of DL shall be allowed within a slotNote: optimization | CATT | N | CATT: In current specification, out-of-order operation for PDSCH to HARQ-ACK can be supported only in slot-level granularity. According to the agreement on TDMed PUCCHs within a slot, it is natural to support out-of-order operation for PDSCH to TDMed HARQ-ACK within a slot. |
| MT.15 | Default TCI-state for PDSCH in Single-DCI based transmissionNote: discussed in previous meeting, no conclusion | Vivo, ZTE, LGE, Lenovo/MotM | N | vivo: default TCI-state for PDSCH in S-DCI based MTRP needs to extend to all schemesOPPO: this issue was discussed in previous meeting too and no conclusion. Do not suggest to discuss it again.  |
| MT.16 | Default QCL for AP CSI-RS in single-DCI based M-TRP | Support: vivo, ZTE, Apple, Ericsson, NTT DOCOMO, Qualcomm, Nokia/NSB, Lenovo/MotM, MediaTekConcern: Huawei/HiSi, OPPO | [H] | DOCOMO: It is highly possible that AP CSI-RS is used in NW to save signaling overhead, hence default QCL for AP CSI-RS is important.Ericsson: This is proposed by many companies as there is a hole in the specifications when it comes to default QCL for AP CSI-RS that collides with PDSCH(s) that is scheduled by a Single-DCI based M-TRP. Since there is wide support for this issue, we prefer to threat this issue with high priority over MT.3. **We suggest to revise the priority to H and relegate the priority of MT. 3 to N for this meeting.**Apple: We think this should be discussed since UE is not expected to support more than two beams, similar as MT. 4Nokia/NSB: same comment as in MT4. Better way is to combine with that and finalize this in this meeting.vivo: it has been discussed several times and seems many companies have similar proposals on this topic, we can discuss it with MT.4 together.Huawei, HiSilicon: It is not essential. It is an enhancement for AP-CSI-RS triggering for CSI measurement, which can be studied further in Rel-17 and has been proposed by several companies already. The default QCL is normally used for the case of time gap is less than the threshold, actually, gNB can schedule a larger gap to avoid default QCL for AP CSI measurement.OPPO: We have concern on MT.16. Default QCL for AP CSI-RS (for either M-DCI or S-DC) has been discussed for a long time and many times, but no conclusion. We doubt whether it is wise to spend more time on this issue. Furthermore, it seems not an essential issue. MediaTek: It is better to at least make a conclusion in this meeting, jointly with MT. 4. |
| MT.17 | Default TCI-state for PDSCH of cross-carrier scheduling in single-DCI M-TRPNote: optimization | Vivo, Samsung, Lenovo/MotM | N |  |
| MT.18 | Determining RV values for Scheme 4Note: current spec is clear | ZTE, CATT | N | CATT: For scheme 4, the redundancy version applied to multiple transmission occasions associated with the first TCI state is derived from the table which was defined for slot aggregation transmission in Rel-15 when using the higher layer parameter pdsch\_AggregationFatcor to configure the repetition number of PDSCH. However, as shown below, in the title of Table 5.1.2.1-2, it’s the applied RV when pdsch\_AggregationFatcor is present. This may lead to a misunderstanding. Table 5.1.2.1-2: Applied redundancy version when *pdsch-AggregationFactor* is present |
| MT.19 | 3 CDM groups vs 2 TCI states in Single-DCI based multi-TRPNote: Current specification suggests that when 2 TCI states are indicated, 3 CDM groups cannot be indicated. | Apple | N |  |
| MT.20 | SPS transmission in Single-DCI based multi-TRPNote: can be further discussed in future meetings  | Ericsson and Qualcomm  | N | Qualcomm: Does the note here mean that SPS in general is optimization or proposed enhancement is optimization?Ericsson: Similar view as Qualcomm. This issue can still be addressed in future RAN1 meetings as part of Rel-16 maintenance. **We suggest to revise the note as ‘Note: can be further discussed in future RAN1 meetings’.** |
| MT.21 | Time restriction on S and L for TDM scheme ANote: current spec is clear | Ericsson | N |  |
|  |  |
| MU.1 | Two clarifications for TS38.2145.2.2.2.5 Enhanced Type II Codebook<Unchanged part omitted>The parameter $R$ is configured with the higher-layer parameter *numberOfPMISubbandsPerCQISubband-r16*. This parameter controls the total number of precoding matrices $N\_{3}$ indicated by the PMI as a function of the number of configured subbands in *csi-ReportingBand*,...Add the text “(if reported)” after the FD basis indicator, $i\_{1,6,l}$, in the description of Group 1 in Sec. 5.2.3 to include the case in which this indicator is not reported, for $M\_{ν}=1$.Fix error in Table 5.2.2.2.5-4: Combinatorial coefficients C(14,6) = 4004 to 3003Note: Obviously needed, not controversial | Nokia/NSB, Spreadtrum, vivo, Apple, Qualcomm, OPPO, Intel, Ericsson, Samsung, Lenovo/MotM, CATT, Fraunhofer IIS/HHI, vivo | H2 | Qualcomm: ok with these editorial changes.OPPO: ok with these editorial changes.Intel: Agree with the proposed corrections. Can be endorsed without discussion since the changes are editorial.Ericsson: okSamsung: okLenovo/MotM: Support the editorial TP.Qualcomm2: changing error in Table 5.2.2.2.5-4: Combinatorial coefficients C(14,6)=3003. This can be addressed together MU.1.CATT: The first change is not essential, but we are ok to have it. The second change is ok to us.Fraunhofer IIS/HHI: Agree vivo: agree with moderator’s proposal |
| MU.2 | Refinement on CBSR equation Note: previously proposed for a few meetings | MotM/Lenovo | N  | Qualcomm: open to discussIntel: Not essential. In our view hard CBSR is enough, so there is no need to optimize equation for soft CBSR.Samsung: not needed, it is an optimization, and has been concluded as non-essential in part few meetingsNokia/NSB: not needed, it was already concluded in the last meeting that there was no consensus on this proposalFraunhofer IIS/HHI: As mentioned before, this seems to be an over-optimization which is not necessaryvivo: agree with moderator’s proposal |
| MU.3 | When $N\_{3}>19$, the size of the intermediate set is give by $N\_{3}^{'}=\left⌈2M\_{1}\right⌉$ for RI={1,2,3,4}, where $M\_{1}$ is the number of FD bases selected for RI={1,2}.Note: previously proposed for a few meetings | Qualcomm  | N | Intel: It is not clear if the performance is significantly improved if we introduce the CR. Regarding the UE complexity, UE can omit some number of FD vectors based on power which is not complex.CATT: It is not an essential change.Nokia/NSB: it was already concluded in the last meeting that there was no consensus on this proposalFraunhofer IIS/HHI: Not requiredvivo: agree with moderator’s proposal |
|  |  |
| UL.1 | Finalizing TPMI grouping indication & answer to RAN2 LS for Mode 2Alt1. Add new TPMI group(s)Alt2. No change in TPMI group, and UE can report >1 TPMI groupsAlt3. Revise at least one TPMI group* Answer to RAN2 LS: TPMIs for 4-port non-coherence can be deduced from the reported set of TPMIs for 4-port partial-coherence. 4-port full coherent UE follow the same way as 4-port partial coherent UE to report full power TPMIs.

Note: discussed over several meetings, but needed for RAN2 to proceed | Alt1. Huawei/HiSi. ZTE, vivo, OPPO, Apple, LGE, Samsung (2nd pref), DOCOMO, CATTAlt2. Samsung (1st pref), OPPO, Apple, ZTE, InterDigital (1st preference) Alt3. Qualcomm, InterDigital (2nd preference)  | H | Qualcomm: Like the Rapporteur already mentioned, this issue is tied with how we answer the RAN 2 LS. For each solution, it needs to include two parts 1) proposal to finalize the TPMI grouping 2) the answer to RAN2 LS if take the solution. These two parts have to be discussed together. Making a decision based on only on the first part does not make sense. Therefore, we strongly suggest proponents of each solution add their answers to RAN2 LS in their solution to complete the proposals.DOCOMO: We believe that the current TPMI grouping is not enough to support many PA architectures. Hence, adding new TPMI group(s) is needed to complete Mode 2 operation.OPPO: support to discuss this issue. During last meetings, many companies illustrate the necessary and typical use cases for adding more TPMI groups.Intel: This issue should be resolved. It could be discussed in UE feature session.Samsung: based on the extensive discussion in past meetings, it will be good to conclude this contentious issue this meeting. Re RAN2 LS reply, we can continue from the email discussion on the reflector. Re Alt 1, we don’t see the need for it, but for progress, we can consider it if the proponents keep the number of new TPMIs small.ZTE: Generally, some new TPMI groups need to be adopted to support more types of PA architecture. As per our view, both alt1 and alt2 can be adopted to extend the reporting of fullpower TPMIs, one difference is that alt1 is an explicit way and alt2 is implicit. Based on that and for progress, we agree with Rapporteur and Qualcomm in principle that the two aspects of TPMIs complement (alt1) and reply to RAN2 LS (alt2) may should be discussed together. Moreover, something between alt1 and alt2 might as a middle ground to address this issue, if any.InterDigital: Per Intel’s suggestion, there should be an Alt4 that is to resolve and discuss a potential solution to the raised issue as part of UE feature discussion. Given the past experience, we believe that Alt1 may be a no-Go for this issue.vivo: need to resolve this issue in this meeting, we are fine with alt1 and can accept alt2 as well. Huawei, HiSilicon: Support to discuss it.**Ericsson**: We will not object to discussion of this topic. But to be candid, it is difficult to support the discussion since we have little to show for the long hours and many email megabytes we have invested. It is also difficult to judge the technical benefit of the proposals, since no results that I am aware of have been provided to this meeting, despite the request from the session Chairman ‘Companies are encouraged to provide simulation results’ at last meeting. While the intuition motivating the discussion is understandable, ‘nice to have’ corrections should not be in scope at this stage, and so I hope proposals address only the most practical UE configuration(s) and are well justified by performance gain.Huawei, HiSilicon2: Just for information. Actually, in last meeting, Huawei provided simulation results and show the gain with adding the missing TPMIs. |
| UL.2 | 2-port PTRS for mode 16.2.3.1 UE PT-RS transmission procedure when transform precoding is not enabled…- PUSCH antenna port 1000 and 1002 in indicated TPMI share PT-RS port 0, and PUSCH antenna port 1001 and 1003 in indicated TPMI share PT-RS port 1 except for the cases that *ul-FullPowerTransmission* is configured to *fullpowerMode1*, and TPMI=2 in Table 6.3.1.5-1, or one of the TPMI 12-15 in Table 6.3.1.5-2 and Table 6.3.1.5-3 in [4, TS 38.211] is indicated.- UL PT-RS port 0 is associated with the UL layer [x] of layers which are transmitted with PUSCH antenna port 1000 and PUSCH antenna port 1002 in indicated TPMI, and UL PT-RS port 1 is associated with the UL layer [y] of layers which are transmitted with PUSCH antenna port 1001 and PUSCH antenna port 1003 in indicated TPMI, where [x] and/or [y] are given by DCI parameter *PTRS-DMRS association* as shown in DCI format 0\_1 described in Clause 7.3.1 of [5, TS38.212].- For the cases that *ul-FullPowerTransmission* is configured to *fullpowerMode1*, and TPMI=2 in Table 6.3.1.5-1, or one of the TPMI 12-15 in Table 6.3.1.5-2 and Table 6.3.1.5-3 in [4, TS 38.211] is indicated, PUSCH antenna port 1000, 1001, 1002 and 1003 in the indicated TPMI share PT-RS port 0. | Huawei/HiSi, ZTE, OPPO, Intel, Ericsson, Samsung, CATT, MediaTek | H | OPPO: Support it since this issue is clear.Intel: Agree to discuss this issue. The current spec is not clear.**Ericsson**: While we are open to discuss, the benefit of the proposal is not yet clear to us. If a partially- or non-coherent full power Mode 1 UE does not need two PT-RS ports for rank 1, why would it need two PT-RS ports for rank 2? If there is some concern with multiple PT-RS ports for a partially- or non-coherent full power Mode 1, a simpler solution seems to be that only 1 PT-RS port is supported in that case.Samsung: ok to discussZTE: Support, and the details of this issue should be further discussed.Apple: it is not a critical issue. If we have more issues to discuss in this meeting than the allocated quota, this can be the one to be droppedCATT: Support in principlevivo: we are open to discuss, however, similar to Ericsson’s comment in the case full power mode1 1 PTRS port should be fineMediaTek: OK to discuss |
| UL.3 | Align the RRC parameter *ul-FullPowerTransmission-r16*across specifications TS 38.212, 213, 214Note: Obviously needed, not controversial, no need for discussion | Spreadtrum | H2 | **Ericsson:** The specs are unambiguous without this change, so I would not say this is a high priority correction. However, I am fine to send it to the editor.Samsung: okZTE: Although it is a correction to an obvious error, to consume an email thread for it seems unnecessary. Agree with Ericsson to let the editor handle it or combine it with other issues.vivo: ok |
| UL.4 | Support for single-port SRS in mode 1Alt1 (OPPO). Add “if each SRS resource in the *SRS-ResourceSet* with *usage* set to 'codebook' has one SRS port, $s=1$”Alt2 (Spreadtrum). Add “A UE shall not expect to be configured with higher layer parameter *ul-FullPowerTransmission-r16* set to ‘*fullpowerMode1’* and *SRS-ResourceSe*t with *usage* set to ‘*codebook*’ with single port SRS resource simultaneously.”Note: Discussed last meeting, common understanding seems to indicate that it’s not needed  | Support: Spreadtrum, OPPOConcern: Ericsson | N | OPPO: The current spec is broken. Thus this issue should be high. We are open to either alternative. If gNB configures “fullpowerMode1” and single-port SRS resource for codebook PUSCH, what this the UE behavior? If such kind configuration is not allow, which part of the spec indicates the restriction?**Ericsson:** Agree with moderator that a change is not needed, even though I also agree with proponents that the value of s is not defined for single port operation with Mode 1 in the current spec. So strictly speaking, UE behavior is not defined for single port Mode 1. On the other hand, there does not seem to be a benefit to define single port operation for Mode 1, since when a UE is configured with single port resource(s), it always transmits PUSCH at Pcmax. Therefore, gNB can treat single port Mode 1 operation as a misconfiguration if it is concerned that UE behavior could be undefined.vivo: we don’t see necessity of this correction, main motivation of mode1 is for SRS port with more than 1 |
| UL.5 | Clarification on port coherence for 2Tx and 4Tx partially coherent UEProposal:* As a first priority, specify that a UE configured for partially coherent operation in full power Mode 1 is not expected to maintain relative phase between ports 0 and 2 nor between ports 1 and 3
* As a second priority, specify that a UE configured for noncoherent operation in full power Mode 1 is not expected to maintain phase coherence among any of its ports.

Note: previously proposed common understanding seems to indicate that it’s not needed | Support: Ericsson, ZTE (N should be H2)Concern: vivo, Huawei/HiSi,  | N | **Ericsson:** As we observe in R1-2006608, Mode 1 partially coherent TPMIs do not have zero magnitude precoder elements, and so it is unclear which ports are non-coherent. Can other companies explain how the UE identifies the coherent ports in the current specification?ZTE: The non-coherent and partial-coherent UE cannot ensure the relative phase indicated by new allowed TPMIs for full power in Mode 1, and consequently, from the spec perspective, the random/ uncontrolled relative phase(s) among TX ports for non-coherent and partial-coherent UE should be specified.vivo: our understanding is that since the codebook subset also includes TPMIs with zero elements, UE behavior is consistent for PUSCH transmission with all TPMIs within the subsetHuawei, HiSilicon: We do not think it is need to be specified, since non-coherent UE is always non phase guarantee in RAN4 design. Mode-1 is only introduced TPMI for enable multiple antenna ports transmission, but not change any definition on the UE capability on non-coherent. So, we do not agree to change to H2. **Ericsson2:** * @vivo: I don’t follow how having TPMIs with zeroes helps understand the specification. A fully coherent UE is expected to maintain phase coherence, even though it is also required to transmit precoding matrices with zero entries. So I think we have to consider each of the precoders independently.
* @Huawei, HiSilicon: I think I may understand your point for non-coherent: UE indicates it supports non-coherent operation, then RAN4 tests will allow large tolerance for phase error between ports. By this logic, there is no strict need to say that UE is not expected to maintain relative phase among ports. But in the partially coherent case, the noncoherent and fully coherent port pairs will behave differently. How will gNB and UE know which port pairs should have the tighter phase coherence?

Huawei, HiSilicon2: To reply to Ericsson. For partial coherent UEs, as we used in Rel-15, the precoder already show which antenna pair is coherent and which pair antennas are non-coherent. It means that in RAN1 we do not need to define the coherency between antenna ports, it is already reflected in precoders. Till now, there is no confusion for current spec, so we do not think it should be add the restriction/definition. **vivo2**: @Ericsson, in the following tables in 38.212 (for mode1), Table 7.3.1.1.2-2A, Table 7.3.1.1.2-2B, Table 7.3.1.1.2-3Athere are *codebookSubset* = *partialAndNonCoherent* and *codebookSubset*= *nonCoherent* only, my understanding of partialAndNonCoherent means same as in Rel-15, UE antenna mapping is same for all TPMIs in this codebook subsetZTE2: @Huawei, HiSilicon @vivo. In Rel-15, the precoders can reflect the coherency between antenna ports is based on the UE capability reporting of coherency. For partial-coherent 4-Tx UEs, the gNB can indicates non or partially coherent TPMI for the codebook based UL transmission, rather than fully coherent TPMI, because such UEs cannot guarantee coherency between antenna ports. However, for Mode 1 in Rel-16, the extended fully coherent TPMIs are allowed to use to the non/partial-coherent UEs, and actually, the non/ partial-coherent UEs still can not guarantee the coherency between all ports due to its limited capability as RAN4 designed. Therefore, it is a clarification, not a restriction/definition. |
| UL.6 | Clarification on 2Tx codebook subset for 2-port SRS (TS 38.214)6.1.1.1 Codebook based UL transmission<Unchanged part omitted>A UE reporting its UE capability of 'partialAndNonCoherent' transmission shall not expect to be configured by *codebookSubset* with 'fullyAndPartialAndNonCoherent*'* and when higher layer parameter *nrofSRS-Ports* in an *SRS-ResourceSet* with *usage* set to 'codebook' indicates that two SRS antenna ports are configured, the UE shall not expect to be configured by *codebookSubset* with 'fullyAndPartialAndNonCoherent*'*. A UE reporting its UE capability of 'nonCoherent' transmission shall not expect to be configured by *codebookSubset* with *'*fullyAndPartialAndNonCoherent*'* or with *'*partialAndNonCoherent'.A UE shall not expect to be configured with the higher layer parameter *codebookSubset* set to *'*partialAndNonCoherent' when higher layer parameter *nrofSRS-Ports* in an *SRS-ResourceSet* with *usage* set to 'codebook' indicates that two SRS antenna ports are configured.Note: Strictly speaking, not ULFPTX issue. For consistency with other non-Rel.16 proposals (e.g. MB-17), the moderator recommends that this be submitted as a Rel.15 CR either in this or a future meeting.  | Support: Vivo, EricssonConcern: ZTE | N | **Ericsson:** I don’t see the benefit of this change. This seems more restrictive than Rel-15. Also, as the moderator comments it does not address full power behavior: the power scaling is 3 dB down from full power for Rel-15 when the UE is configured for 2 ports rather than 4 ports.ZTE: Not needed.vivo:This is not related to ULFPTx, and Rel-15 is not clear however it was rejected for Rel-15 in RAN1#101e. We provided 2 options in last meeting, I would like to check with the group which option is the common understandingOption1:6.1.1.1 Codebook based UL transmission<Unchanged part omitted>A UE reporting its UE capability of 'partialAndNonCoherent' transmission shall not expect to be configured by codebookSubset with 'fullyAndPartialAndNonCoherent' except when higher layer parameter nrofSRS-Ports in an SRS-ResourceSet with usage set to 'codebook' indicates that two SRS antenna ports are configured. Option2:6.1.1.1 Codebook based UL transmission<Unchanged part omitted>A UE reporting its UE capability of 'partialAndNonCoherent' transmission shall not expect to be configured by codebookSubset with 'fullyAndPartialAndNonCoherent' and when higher layer parameter nrofSRS-Ports in an SRS-ResourceSet with usage set to 'codebook' indicates that two SRS antenna ports are configured the UE shall not expect to be configured by codebookSubset with 'fullyAndPartialAndNonCoherent'.**Ericsson2:** @vivo: Thanks for the further discussion and good question. Option 1 is the logical behavior in my understanding. |

1. Discussion and proposal

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

* The following four issues can be designated as H2 (editorial TPs that can be agreed without further email discussion): MB.3, MB.10, MU.1, UL.3
	+ Note: On UL.3, the concern raised by one company can be resolved since H2 does not require any further discussion
* The following five issues can be designated as essentially uncontested H: MB.6, MT.2, MT.3, UL.1, and UL.2
	+ Note: On MT.3, the concern raised by some companies can be resolved as long as it is understood that not every individual TP is already agreed in principle
* One of the following issues can potentially be designated as H (although contested): MB.1, MT.4, and MT.16
	+ MB.1 is supported by 9 companies (impaired PL RS support for DCI 0\_2) and opposed by 1 company (new feature therefore N).
		- Moderator assessment: The opponent does not provide a counter-argument against the impairment identified by the proponents
	+ MT.4 and MT.16 are supported by the same 11 companies who propose to combine the discussion of the two into one thread (needed for AP-CSI-RS usage with multi-DCI). On the other hand, MT.4 is opposed by 1 company (it has been discussed for several meetings, can be solved via implementation) while MT.16 by 3 companies (it has been discussed for several meetings, can be solved via implementation, optimization within the scope of Rel.17 FeMIMO).
		- Moderator assessment: As pointed out by Huawei, this issue can perhaps be correctly categorized as an optimization. Considering the number of proponents while, at the same time, acknowledging that this issue can be contentious even among the proponents (it has been discussed for several meetings), it may be fitting to give this issue one more chance. If no consensus can be reached in this meeting, this issue should no longer be discussed as a part of Rel.16 NR eMIMO maintenance.

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

* Agree in principle on the proposals in MB.3, MB.10, MU.1, UL.3
	+ Respective FLs will provide the draft TPs
* The following seven issues will be assigned email threads for further discussion in RAN1#102-e: MB.1, MB.6, MT.2, MT.3, MT.4+16, UL.1, UL.2
	+ If no consensus can be reached on MT.4+16 in RAN1#102-e, this issue will no longer be discussed in Rel.16 NR eMIMO maintenance

# Appendix A: TP for MB.10

***TP for 38.212***

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 6.3.2.1.2 CSI <unchanged part omitted>The mapping order of CSI fields of one report for CRI/RSRP or SSBRI/RSRP reporting is provided in Table 6.3.1.1.2-8. The mapping order of CSI fields of one report for CRI/SINR or SSBRI/SINR reporting is provided in Table 6.3.1.1.2-8A.The procedure in clause 6.3.2 described for CSI part 1 is also applicable for one report for CRI/RSRP, SSBRI/RSRP, CRI/SINR, or SSBRI/SINR reporting.Table 6.3.2.1.2-3: Mapping order of CSI fields of one CSI report, CSI part 1

|  |  |
| --- | --- |
| CSI report number | CSI fields |
| CSI report #nCSI part 1 | CRI as in Tables 6.3.1.1.2-3/4/6, if reported |
| Rank Indicator as in Tables 6.3.1.1.2-3/4/5 or 6.3.2.1.2-8, if reported |
| Wideband CQI for the first TB as in Tables 6.3.1.1.2-3/4/5 or 6.3.2.1.2-8, if reported |
| Subband differential CQI for the first TB with increasing order of subband number as in Tables 6.3.1.1.2-3/4/5 or 6.3.2.1.2-8, if reported |
| Indicator of the number of non-zero wideband amplitude coefficients $M\_{0}$ for layer 0 as in Table 6.3.1.1.2-5, if reported |
| Indicator of the number of non-zero wideband amplitude coefficients $M\_{1}$ for layer 1 as in Table 6.3.1.1.2-5 (if the rank according to the reported RI is equal to one, this field is set to all zeros), if 2-layer PMI reporting is allowed according to the rank restriction in Clauses 5.2.2.2.3 and 5.2.2.2.4 [6, TS 38.214] and if reported |
| Indicator of the total number of non-zero coefficients summed across all layers $K^{NZ}$ as in Table 6.3.2.1.2-8, if reported |
|  |
|  |
| Note: Subbands for given CSI report *n* indicated by the higher layer parameter *csi-ReportingBand* are numbered continuously in the increasing order with the lowest subband of *csi-ReportingBand* as subband 0. |

<unchanged part omitted>Table 6.3.2.1.2-6: Mapping order of CSI reports to UCI bit sequence , with two-part CSI report(s)

|  |  |
| --- | --- |
| UCI bit sequence | CSI report number |
|  | CSI part 1 of CSI report #1 as in Table 6.3.2.1.2-3 or Table 6.3.1.1.2-8 or Table 6.3.1.1.2-8A |
| CSI part 1 of CSI report #2 as in Table 6.3.2.1.2-3 or Table 6.3.1.1.2-8 or Table 6.3.1.1.2-8A |
| … |
| CSI part 1 of CSI report #n as in Table 6.3.2.1.2-3 or Table 6.3.1.1.2-8 or Table 6.3.1.1.2-8A |

<unchanged part omitted> |

***TP for 38.213***

|  |
| --- |
| **6 Link Reconfiguration**A UE can be provided, for each BWP of a serving cell, a set  of periodic CSI-RS resource configuration indexes by *failureDetectionResources* and a set  of periodic CSI-RS resource configuration indexes and/or SS/PBCH block indexes by *candidateBeamRSList* or *candidateBeamRSListExt-r16* or *candidateBeamRSSCellList-r16* for radio link quality measurements on the BWP of the serving cell. If the UE is not provided  by *failureDetectionResources* for a BWP of the serving cell, the UE determines the set  to include periodic CSI-RS resource configuration indexes with same values as the RS indexes in the RS sets indicated by *TCI-State* for respective CORESETs that the UE uses for monitoring PDCCH and, if there are two RS indexes in a TCI state, the set  includes RS indexes with QCL-TypeD configuration for the corresponding TCI states. The UE expects the set  to include up to two RS indexes. The UE expects single port RS in the set . The UE expects single-port or two-port CSI-RS with frequency density equal to 1 or 3 REs per RB in the set . |

TS 38.213 Section 9.2.4

-------- unchanged part omitted ---------------

A UE can be configured by *SchedulingRequestResourceConfig* a set of configurations for SR in a PUCCH transmission using either PUCCH format 0 or PUCCH format 1. A UE can be configured by *schedulingRequestID-BFR-SCell-r16* a configuration for LRR in a PUCCH transmission using either PUCCH format 0 or PUCCH format 1. The UE can be provided, by *phy-PriorityIndex-r16* in *SchedulingRequestResourceConfig*, a priority index 0 or a priority index 1 for the SR. If the UE is not provided a priority index for SR, the priority index is 0.

The UE is configured a PUCCH resource by *SchedulingRequestResourceId*, or by *schedulingRequestID-BFR-SCell-r16*, providing a PUCCH format 0 resource or a PUCCH format 1 resource as described in Clause 9.2.1. The UE is also configured a periodicity  in symbols or slots and an offset  in slots by *periodicityAndOffset* for a PUCCH transmission conveying SR. If  is larger than one slot, the UE determines a SR transmission occasion in a PUCCH to be in a slot with number  [4, TS 38.211] in a frame with number  if .

-------- unchanged part omitted ---------------

TS 38.213 Section 9.2.5.1 UE procedure for multiplexing HARQ-ACK or CSI and SR in a PUCCH

In the following, a UE is configured to transmit  PUCCHs for respective  SRs in a slot, as determined by a set of *schedulingRequestResourceId* and a *schedulingRequestResourceId* associated with *schedulingRequestID-BFR-SCell-r16*, with SR transmission occasions that would overlap with a transmission of a PUCCH with HARQ-ACK information from the UE in the slot or with a transmission of a PUCCH with CSI report(s) from the UE in the slot.

-------- unchanged part omitted ---------------

If a UE would transmit a PUCCH with  HARQ-ACK information bits in a resource using PUCCH format 2 or PUCCH format 3 or PUCCH format 4 in a slot, as described in Clauses 9.2.1 and 9.2.3,  bits representing a negative or positive SR, in ascending order of the values of *schedulingRequestResourceId* anda *schedulingRequestResourceId* associated with *schedulingRequestID-BFR-SCell-r16*, are appended to the HARQ-ACK information bits and the UE transmits the combined  UCI bits in a PUCCH using a resource with PUCCH format 2 or PUCCH format 3 or PUCCH format 4 that the UE determines as described in Clauses 9.2.1 and 9.2.3. If one of the SRs is a positive LRR, the value of the  bits indicates the positive LRR. An all-zero value for the  bits represents a negative SR value across all  SRs.

If a UE would transmit a PUCCH with  CSI report bits in a resource using PUCCH format 2 or PUCCH format 3 or PUCCH format 4 in a slot,  bits representing corresponding negative or positive SR, in ascending order of the values of *schedulingRequestResourceId* and a *schedulingRequestResourceId* associated with *schedulingRequestID-BFR-SCell-r16*, are prepended to the CSI information bits as described in Clause 9.2.5.2 and the UE transmits a PUCCH with the combined  UCI bits in a resource using the PUCCH format 2 or PUCCH format 3 or PUCCH format 4 for CSI reporting. If one of the SRs is a positive LRR, the value of the  bits indicates the positive LRR. An all-zero value for the  bits represents a negative SR value across all  SRs.

***TP for 38.214***

|  |
| --- |
| < Start of the text proposal on TS 38.214 v16.2.0 section 5.6.1.6>< Unchanged parts are omitted >5.1.6.1 CSI-RS reception procedureThe CSI-RS defined in Clause 7.4.1.5 of [4, TS 38.211], may be used for time/frequency tracking, CSI computation, L1-RSRP computation, L1-SINR computation and mobility. < Unchanged parts are omitted >< End of the text proposal on TS 38.214 v16.2.0 section 5.6.1.6> |

|  |
| --- |
| 5.2.1.4.1 Resource Setting configuration< Unchanged parts are omitted >For semi-persistent or periodic CSI, each *CSI-ReportConfig* is linked to periodic or semi-persistent Resource Setting(s):- When one Resource Setting (given by higher layer parameter *resourcesForChannelMeasurement*) is configured, the Resource Setting is for channel measurement for L1-RSRP or for channel and interference measurement for L1-SINR computation.- When two Resource Settings are configured, the first Resource Setting (given by higher layer parameter *resourcesForChannelMeasurement*) is for channel measurement and the second Resource Setting (given by higher layer parameter *csi-IM-ResourcesForInterference*) is used for interference measurement performed on CSI-IM. For L1-SINR computation, the second Resource Setting (given by higher layer parameter *csi-IM-ResourcesForInterference* or higher layer parameter *nzp-CSI-RS-ResourceForInterference*) is used for interference measurement performed on CSI-IM or on NZP CSI-RS.< Unchanged parts are omitted > |

***TP for 38.215***

|  |
| --- |
| 5.1.6 CSI signal-to-noise and interference ratio (CSI-SINR)< Unchanged parts are omitted >For CSI-SINR determination CSI reference signals transmitted on antenna port 3000 according to TS 38.211 [4] shall be used. If CSI-SINR is used for L1-SINR, CSI reference signals transmitted on ports 3000, 3001 can be used for CSI-SINR determination.< Unchanged parts are omitted > |

# Appendix B: TP for MT.3

|  |  |  |
| --- | --- | --- |
| **MT.3 index** | **Summary of TP** | **Proposing companies** |
| MT.3.1 | Align the RRC parameter names | Vivo, Spreadtrum, Sharp |
| MT.3.2 | Default QCL of PDSCH for DCI format 1\_2 | vivo |
| MT.3.3 | TCI states for inter-slot PDSCH repetition | vivo |
| MT.3.4 | Clarify UL transmission from different TRP shall be TDMed | ZTE |
| MT.3.5 | Type 1 HARQ codebook | ZTE |
| MT.3.6 | TBS determination for Scheme 3 | ZTE |
| MT.3.7 | Wideband PRG for Scheme 2a/2b | ZTE |
| MT.3.8 | A missing condition for two default TCI state for Multi-DCI based system in TS 38.214 | OPPO |
| MT.3.9 | One part in the agreement made in RAN1#101e was not captured in TP | OPPO |
| MT.3.10 | TP to capture the case “is not provided with CORESETPoolIndex” in TS 38.213 | Spreadtrum |
| MT.3.11 | One Typo correction | CATT |
| MT.3.12 | TP for the case “*startingSymbolOffset is* not configured” | LGE |
| MT.3.13 | determine $n\_{HARQ-ACK}$ for PUCCH transmission in M-DCI M-TRP | Huawei/HiSi |
| MT 3.14 | Type-1 HARQ-ACK codebook determination for Scheme 3 | NTT DOCOMO, Nokia/NSB, Samsung |

# References

1. R1-2005353 Remaining issues on Multi beam operation vivo
2. R1-2005354 Remaining issues on Multi TRP operation vivo
3. R1-2005355 Miscellaneous corrections on Rel-16 MIMO vivo
4. R1-2005449 Maintenance of multi-beam operation ZTE
5. R1-2005450 Maintenance of full power UL transmission ZTE
6. R1-2005451 Maintenance of Multi-TRP enhancements ZTE
7. R1-2005554 Remaining issues on NR MIMO Interdigital Inc.
8. R1-2005559 Remaining issues on multi-beam operation Sony
9. R1-2005624 Remaining issues on multi-beam operation Mediatek Inc.
10. R1-2005679 Remaining issues on multi-beam operation enhancement CATT
11. R1-2006588 Discussion on remaining issues of multi-TRP/panel transmission CATT
12. R1-2005819 Maintenance on multi-TRP operation Lenovo, Motorola Mobility
13. R1-2005924 Maintenance on MU-CSI Enhancements Lenovo, Motorola Mobility
14. R1-2005853 Corrections to multi TRP Intel Corporation
15. R1-2005975 Text proposals for enhancements on multi-TRP and panel Transmission OPPO
16. R1-2005976 Text proposals for Multi-beam Operation Enhancement OPPO
17. R1-2005977 Discussion and Text proposals for full TX power UL transmission OPPO
18. R1-2006115 On maintenance of Rel.16 MU CSI enhancements and multi-beam operation Samsung
19. R1-2006117 On Rel.16 multi-TRP/panel transmission Samsung
20. R1-2006118 On UL full power transmission Samsung
21. R1-2006249 Remaining issues on CSI enhancement for MU-MIMO Spreadtrum Communications
22. R1-2006256 Discussion on remaining issues on UL full power transmission Spreadtrum Communications
23. R1-2006257 Discussion on remaining issues for multi-TRP operation Spreadtrum Communications
24. R1-2006395 Remaining issues for Multi-TRP in Rel-16 Huawei, HiSilicon
25. R1-2006396 Remaining issues on multi-beam enhancements in R16 Huawei, HiSilicon
26. R1-2006397 Remaining issues on UL full power transmission in R16 Huawei, HiSilicon
27. R1-2006494 Remaining issues on Multi-TRP enhancement Apple
28. R1-2006495 Remaining issues on Beam Management Apple
29. R1-2006496 Remaining issues on Rel-16 full power transmission Apple
30. R1-2006551 Corrections for enhancements on MIMO for NR Sharp
31. R1-2006593 Text proposals on enhancements on multi-TRP/panel transmission LG Electronics
32. R1-2006594 Remaining issues on multi beam operation LG Electronics
33. R1-2006595 Discussions on full Tx power UL transmission LG Electronics
34. R1-2006608 Corrections for Full Power UL Transmission Ericsson
35. R1-2006688 Remaining issues on single-DCI based Multi-TRP Ericsson
36. R1-2006689 Remaining issues on multi-DCI based Multi-TRP Ericsson
37. R1-2006635 Maintenance of SCell Beam Failure Recovery Asia Pacific Telecom co. Ltd
38. R1-2006700 Remaining issues on multi-TRP/panel transmission NTT DOCOMO, INC.
39. R1-2006701 PUCCH/PDCCH beam after CBRA-BFR in Rel.16 NTT DOCOMO, INC., Nokia, Nokia Shanghai Bell, Ericsson
40. R1-2006780 Remaining issues on MU-CSI enhancement, UL full power, and low PAPR RS Qualcomm Incorporated
41. R1-2006781 Multi-TRP Enhancements Qualcomm Incorporated
42. R1-2006782 Enhancements on Multi-beam Operation Qualcomm Incorporated
43. R1-2006840 Correction of RRC parameter name for AP-TRS Nokia, Nokia Shanghai Bell
44. R1-2006841 Maintenance of Rel-16 CSI enhancement Nokia, Nokia Shanghai Bell
45. R1-2006842 Maintenance of Rel-16 Multi-TRP operation Nokia, Nokia Shanghai Bell