**3GPP TSG RAN WG1 #103-e R1-2008140**

**e-Meeting, October 26th – November 13th, 2020**

**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
* *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.x |  |  |  |  |
|  |
| MB.1  | Specifying TCI state codepoint mapping for DCI format 1\_2FL note: Remaining work from the Reply LS (R1-2007197) | Samsung, Qualcomm, Ericsson | H | Apple: OkayLG: OK to discuss |
| MB.2 | Clarifying that multi-CC simultaneous TCI update can be applied to CORESET#0 FL note: Good clarification for aligning TS38.321 and TS38.213 | Vivo | H2 | Apple: we do not see the necessity of this CR, since the corresponding behavior is clearly defined in 38.321. In addition, this CR seems ambiguous since the range of p is defined to be 0<p<12 or 0<p<16, which is configured by controlResourceSetId, and this CR proposed a condition like p>=0.From the product implementation perspective, we do not see ambiguity in terms of the expected UE behavior. We are fine to make 38.213 clearer. But we think more time should be given to clarify the issues that has product implementation impact such as MT.13 and MT.17. **Qualcomm**: Strictly speaking, not needed. Because the main bullet “a CORESET index p, by controlResourceSetId, where” does not have any restriction on the index p. So it can be equal to 0. |
| MB.3 | Aligning RRC parameter names with TS38.331 (MediaTek’s TP handles the names of the CC lists and Nokia’s TP handles the names of QCL types)FL note: Editorial corrections | MediaTek, Nokia/NSB | H2 | Apple: OkayLG: Support |
| MB.4 | Text change made in #102-e for default PL RS for DCI format 0\_2 was not same as the agreed TP, and it is proposed to adopt the agreed TP due to potential misunderstanding of the current text.FL note: Current text seems to have the same meaning with the agreed TP. | ZTE | N | LG: Agree with FL’s assessment |
| MB.5 | Further refinement on the QCL definition FL note: Proposal is not related to Rel-16 features and seems not critical | Samsung | N | LG: Agree with FL’s assessment |
| MB.6 | Supporting default spatial relation/PL RS for Rel-16 MTRP featuresFL note: Extension of feature, considered as not essential issue | Apple | N | **Qualcomm**: Support for it as “H”. The extension is beneficial, since mTRP default beam is only defined for DL but not for UL. So the reliability gain cannot be truly achieved if not considering UL enhancementLG: Agree with FL’s assessment |
| MB.7 | Supporting default PL RS in FR1FL note: Discussed in the last meeting but not agreed | Qualcomm | N | **Qualcomm**: Support for it as “H”. This topic is not selected for formal discussion in last meeting due to the limited topic #.LG: Agree with FL’s assessment |
| MB.8 | Support SSB for SCell BFD (TP2 in R1-2007748)Delete SSB in PCell/PSCell for BFD (TP2 in R1-2008213)FL note: TP from ZTE reverts previous agreement, and TP from OPPO is related to PCell BFR. | ZTE, OPPO | N | LG: Agree with FL’s assessment |
| MB.9 | After SCell BFR, define CORESET pool index = 0 for all CORESETs (TP3 in R1-2007748)FL note: This is a new issue, but it seems this is related to Rel-17 TRP specific BFR. | ZTE | N | LG: Agree with FL’s assessment |
| MB.10 | Correction on L1-SINR Resource Setting (R1-2007909)1. Editorial correction (add SSB in CMR)
2. Support both ZP and NZP IMR

Do not support both ZP and NZP IMR (R1-2008571)FL note: Whether to support both ZP and NZP IMR has been discussed multiple times. | FutureWei, LGE | N for 2H2 for editorial correction | Apple: Okay. For the second bullet, we prefer to either not discuss it, or to remove the specification in bracket for CMR + ZP-IMR + NZP-IMR (not support this feature)**Qualcomm**: Support for “H2” of LG’s proposal. This has been discussed multiple times and not agreed in the formal discussion among selected topics in last meeting.LG: Although this issue has been controversial, it is unfortunate if there still exist some text in square brackets until v16.4.0 of Rel-16 spec. |
| MB.11 | Specify that the UE shall apply same QCL-TypeD assumption on channel measurement and interference measurement when QCL-TypeD RS is not configured to the NZP CSI-RS resource for channel measurement. (TP1 in R1-2008213)FL note: This seems to be a resubmission, and according to the feedback in previous meetings, not to configure QCL for CSI-RS looks to be a general issue. | OPPO | H | Apple: OkayGood to discuss. However, we prefer the QCL-TypeD always be configured for NZP-CSI-RS or the default QCI behavior is well defined for NZP-CSI-RS**Qualcomm**: Not essential. There is no valid use case for this scenario. If CMR has no QCL-D configured, UE does not even know it will be transmitted by same gNB beam over different occasions for UE to determine its Rx beam.LG: Seems not critical issue. It would be more typical to use L1-RSRP based BM for CSI-RS without QCL-D for initial P-1 or P-2 operation |
| MB.12 | Update referenes to *nrofReportedRSForSINR* as to *nrofReportedRS* in 38.214. (R1-2008324, R1-2008641)FL note: Editorial correction. | Huawei/HiSil, Nokia/NSB | H2 | Apple: OkayLG: OK |
| MB.13 | PUCCH spatial relation assumption after CBRA-BFR (R1-2008536)FL note: This was discussed in last meeting, and the proposal seems to be updated based on some discussion in last meeting. | Docomo, Nokia/NSB, IDC | H | Apple: Okay, Supportive as high priorityLG: OK |
| MB.14 | Define measurement restriction related UE behavior for L1-SINR measurement (R1-2008674)FL note: This seems to be related to previous conclusion and aligned with agreed CR for L1-RSRP. | vivo | H | Apple: Okay, Supportive as high priority **Qualcomm**: Not essential. Without additional clarification, UE will follow the same rule for L1-RSRP. No ambiguity. |
|  |  |
| MT.1 | TP to capture the agreement on default TCI state of AP CSI-RS in mTRP* ZTE (R1-2007750) proposed TP to capture the agreement
* OPPO (R1-2008212) provided TP to capture the agreement of default TCI state of AP CSI RS in mTRP
* Apple (R1-2008436) provided TP to capture that
* Ericsson (R1-2008635) also provided TP for that agreement
* vivo (R1-2008675) proposed TP too

FL note: it is the agreement made in last meeting but no time to discuss the TP in last meeting. | ZTE,OPPO, Apple, Ericsson, vivo | H | Apple: Okay, Supportive as high priority**Qualcomm**: Our understanding is that this item should be separately handled in terms of the budget, based on the following note:* “Note: for the agreements from previous meetings without the corresponding TPs, draft CRs are to be prepared and endorsed in email threads separately, from the budget above”.

LG: OK |
| MT.2 | Issue 1: The issue of PDCCH and PDSCH collide with different QCL-TypeD* ZTE (R1-2007750) proposed to clarify UE behavior for the case when PDCCH and PDSCH with different QCL-TypeD collide.
* Apple (R1-2008436) propose that priority rule of PDSCH colliding with PDCCH is applied to per CORESETPoolIndex
* vivo (R1-2008675) proposed to conclude that PDSCH and PDCCH for different TRP shall not overlap

Issue 2: Clarify PDCCH monitoring with respect to a QCL-TypeD in M-DCI mTRP:* ZTE(R1-2007750)proposed to support two QCL-TypeD for PDCCH reception at a given time in M-DCI.
* Intel [R1-2007938] proposed to extend the PDCCH prioritization based on QCL-TypeD to M-DCI multi-TRP operation.
* Spreadtrum (R1-2008093) proposed to specify the priority rules of monitoring PDCCHs is applied within the CORESETs with the same value of CORESETPoolIndex
* Qaulcomm (R1-2008610) proposed to specify that Rel. 15 procedures on PDCCH for QCL prioritization is done per CORESETPoolIndex
* Nokia (R1-2008723) proposed to specify that For a UE capable of simultaneous reception with different QCL-TypeD, the PDCCH monitoring priority rule based on QCL-TypeD is applied within CORESETs of the same coresetPoolIndex.
 | ZTE, Intel, Spreadtrum, Apple, vivo, Nokia, Qualcomm | H | Apple: Okay, Supportive as high priority**Qualcomm**: Supportive as high priority.LG: Both issues are not essential; it can discussed in Rel-17 if needed. Issue 2 was discussed in the last UE feature session but no consensus was reached. |
| MT.3 | The issue of default TCI state for PDSCH in S-DCI mTRP* ZTE (R1-2007750) propose to Clarify the default TCI state for single-DCI mTRP: scheme 1a/2a/2b for the following cases: When one TCI state is indicated and When two TCI states are indicated
* vivo (R1-2008675) proposed to specify the default TCI state for:
	+ Indicating one TCI state
	+ TCI field is not present
	+ Scheme 2a/2b

FL note: this issue has been discussed in previous meeting | ZTE, vivo | N | LG: Agree with FL’s assessment |
| MT.4 | ZTE ((R1-2007750) proposed to specify the UE behavior in single-DCI mTRP transmission when sequenceOffsetforRV-r16 is not configured. FL note: This issue can be avoided by implementation. | ZTE | N | LG: Agree with FL’s assessment |
| MT.5 | The issue of 3 CDMs groups in S-DCI mTRP:* Apple (R1-2008436) proposed to clarify that 3 CDMs groups should not be used in mTRP

FL note: Current specification suggests that when 2 TCI states are indicated, 3 CDM groups cannot be indicated | Apple | N | Apple: Just to clarify whether what FL’s note is common understanding, if that is the case, we suggest marking it as ‘**H2**’ and to make what FL said as a quick conclusion.LG: Agree with FL’s assessment |
| MT.6 | The issue of radio link monitoring in mTRP:* Apple (R1-2008436) proposed to specify the method of UE determining RLM RS in M-DCI mTRP system

FL note: Optimization | Apple | N | Apple: This CR includes two changes: one is an editorial change to include Lmax = 8 since for mDCI, there can be 5 CORESETs. We suggest at least handling the following editorial change as ‘**H2**’.“- For  and *Lmax* = 8, the UE selects the  RS provided for active TCI states for PDCCH receptions in CORESETs associated with the search space sets in an order from the shortest monitoring periodicity. If more than one CORESETs are associated with search space sets having same monitoring periodicity, the UE determines the order of the CORESET from the highest CORESET index as described in Clause 10.1.”LG: Agree with FL’s assessment |
| MT.7 | The issue of RV value for PDSCH scheme 4:* CATT (R1-2007818) proposed that table 5.1.2.1-2 in 38.214 is used to specify the RV for PDSCH with aggregation factor or scheme 4. So, R1-2007818 proposed to use a separate table to specify the RV for PDSCH of scheme 4.

FL note: It seems there is no confusion in current spec. | CATT | N | LG: Agree with FL’s assessment |
| MT.8 | The issue of out-of-order of PDSCH in mTRP:* CATT (R1-2007818) 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

FL note: It seems to be optimization | CATT | N | LG: Agree with FL’s assessment |
| MT.9 | Spreadtrum (R1-2008093) proposed * to add the constraint at N\_"cells" ^"Cap" in text description when UE does not report pdcch-BlindDetectionCA:

FL note: It captures what is included in one previous agreement. | Spreadtrum, Qualcomm | H2 | Apple: We have concern on this issue. Yes, we do have a previous agreement. However, in Rel-15, when UE does not report pdcch-BlindDetectionCA, UE supports PDCCH monitoring BD and CCE linear scaling for any number of CCs. This is clearly captured in the Rel-15 specification. Rel-16 specification follows the same principle. There are two options, which we prefer the first option1. We do not discuss this issue, i.e., “N”
2. If we ever need to discuss this issue, we need to discuss the previous quoted agreement. It is “H”

**Qualcomm**: In our understanding, this is editorial, and a good clarification to avoid any confusion. This issue can be combined with issue MT. 19. |
| MT.10 | Spreadtrum (R1-2008093) proposed to delete redundant description in Section 9.1.2 of 38.213FL note: Not essential  | Spreadtrum | N | LG: Agree with FL’s assessment |
| MT.11 | Clarify in 38.214 the default TCI state for PDSCH of cross-carrier scheduling in single-DCI based mTRP* Samsung (R1-2008141) propose to specify the default TCI state of PDSCH of cross-carrier in single-DCI based mTRP.
* vivo (R1-2008675) also proposed to specify the default TCI state for cross-carrier scheduling case.

FL note: It is a further optimization.  | Samsung, vivo | N | LG: Agree with FL’s assessment |
| MT.12 | Issue of SPS transmission in mTRP:* Samsung (R1-2008141) proposed to include the SPS of scheme 4 in the description of Type-1 HARQ-ACK codebook determination.
* Samsung (R1-2008141) propose to specify how to receive two overlapped SPS PDSCHs associated with different TRPs in M-DCI mTRP
* LGE proposed the following TP to support SPS of mTRP transmission.

* Qualcomm (R1-2008610) proposed Clarification that the RV sequence used across multiple repetitions in schemes 2b, 3, and 4 is based on setting rvid=0. And Qualcomm 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 (R1-2008637) provided TP for the change: specifies the RV values to be assumed for DL SPS scheduled with single DCI based multi-TRP PDSCH repetition schemes. To indicate RV values for DL SPS based multi-TRP PDSCH repetition schemes, a similar approach to what is adopted for Rel-15 based DL SPS PDSCH repetition is reused.

FL note: supporting mTRP SPS seems to be optimization  | Samsung, LGE, Qualcomm, Ericsson | N | **Qualcomm**: We suggest to remove the FL note as the issue is not an optimization. SPS is a basic feature, and excluding it for mTRP does not make sense to us. If there is no time in this meeting, the issue should be discussed in the next meeting.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. |
| MT.13 | The issue of PUCCH/PUSCH overlapping with two HARQ-ACKs associated with different TRPs* OPPO (R1-2008211) and vivo (R1-2008675) proposed to specify in 38.213 that this case is not expected by the UE

FL note: it can be resolved by system implementation. | OPPO, vivo | N | This is high priority for us. There are commercial interest of deploying MDCI MTRP. For device to support MDCI MTRP, it is very likely that the UE needs to support separate HARQ-ACK PUCCH, to accommodate the non-ideal backhaul of NW. We need to have UE UL multiplexing rule clearly defined.We propose this to be “**H**”, replacing UL.2 LG: Agree with FL’s assessment |
| MT.14 | The issue of closed-loop power control in mTRP* OPPO (R1-2008211) proposed to specify a default closed loop index for CORESETPoolIndex = 1 related with out-of-order operation.
* OPPO (R1-2008211) proposed to specify the default pathloss for mTRP case.

FL note: The issue of closed-loop power control related with out-of-order was discussed in last meeting and some companies commented there is no spec impact | OPPO | N | LG: Agree with FL’s assessment |
| MT.15 | The issue of active BWP in M-DCI mTRP system:* Lenovo/MOT (R1-2008293) 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 note: It seems to be further optimization. Comment from companies in previous meeting is this is not an issue. | Lenovo/MOT | N | LG: Agree with FL’s assessment |
| MT.16 | CR on maximum number and index value of CORESET in M-DCI mTRP:* Huawei (R1-2008325) proposed the TP on maximum number of CORESETs:

* Huawei (R1-2008326) proposed the TP on index value of CORESETs:

Note: the current spec looks clear | Huawei | N | LG: Agree with FL’s assessment |
| MT.17 | The issue of sub-slot based HARQ-ACK feedback vs M-DCI mTRP:* Apple (R1-2008436) propose to clarify whether sub-slot based HARQ-ACK feedback can be used in M-DCI mTRP
 | Apple | N | Apple: We also proposed to clarify whether two HARQ-ACK codebooks with different priorities can be used with MDCI MTRP. This is high priority for us.There are commercial interest of deploying MDCI MTRP, so the UE may support MDCI MTRP.On the other side, the UE may also choose to support some Rel-16 eURLLC HARQ-ACK PUCCH enhancement including (1) sub-slot based HARQ-ACK PUCCH (2) two HARQ-ACK codebook with different prioritiesThere has not been any discussion in terms of the interaction between eURLLC enhancement and MDCI MTRP. It has UE implementation impact. We propose this to be “**H**”, replacing UL.2 together with MT.13LG: Agree with FL’s assessment |
| MT.18 | The issue of BFR in mTRP:* Qualcomm (R1-2008610) proposed to specify that for S-DCI mTRP, after BFR, the UE reset all the TCI state point to the qnew.

Note: rel17 is discussing BFR in mTRP now. | Qualcomm | N | **Qualcomm**: What is being discussed in Rel. 17 is per-TRP BFR. The issue mentioned in MT. 18 is not related to Rel. 17. Our understanding is that this issue is critical and **should be assigned high priority**. The issue is that in current spec, there is no way for UE and gNB to communicate after BFR in certain cases for single-DCI based mTRP.LG: Agree with FL’s assessment |
| MT.19 | The issue of NR-DC and M-DCI based mTRP* Qualcomm (R1-2008610) proposed to clarify BD/CC limit in the presence of NR-DC in M-DCI based mTRP system

Note: optimization | Qualcomm | N | **Qualcomm**: We suggest to remove the FL note as the issue is not an optimization. NR-DC is a basic feature, and excluding it for mTRP does not make sense to us. If there is no time in this meeting, the issue should be discussed in the next meeting. If we decide to address issue MT. 9, it can be bundled with this issue.LG: Agree with FL’s assessment |
| MT.20 | Quectel (R1-2008569) proposed a TP to delete redundant text:Note: It looks like that the text does not have redundancy. | Quectel | N | LG: Agree with FL’s assessment |
|  |  |
| UL.1 | Port coherence assumption in UL full power Mode1FL note: This has been discussed for several meetings | ZTE | N | **Qualcomm**: this is non-essential issue. LG: Agree with FL’s assessment |
| UL.2 | PTRS port assumption in the case of rank-1 full coherent TPMI and 2 PTRS portsFL note: This has been discussed in last meeting.  | CATT | H(?) | Apple: We do not need to discuss this. It has been discussed in the last meeting and the UE behavior is clear. Or we can clarify it with “**H2**”**Qualcomm**: this issue should be non-essential. Actually, based on our study which was already shared in last meeting, this is even not an issue. There is no problem in current spec for PTRS port association in this case. There is no need to discuss this not-existing “issue”. LG: Fine to further discuss this |
| UL.3 | UL full power and single port SRS configurationFL note: This has been discussed for several meetings.  | Spreadtrum | N | **Qualcomm**: this issue is not essential.LG: Agree with FL’s assessment |
| UL.4 | To capture TPMI groups in spec. (Samsung proposes to capture in 38.214, LG proposes to capture in 38.306) | Samsung, LG | H | Apple: Okay**Qualcomm**: This issue is not essential. This is just about where to capture existing agreement. RAN1 should spend time on more important issues in Rel-16 MIMO maintenance. Regarding where to capture the agreement, we think it should be captured in 38.306 because this is about UE capability reporting.LG: Support |
|  |  |  |  |  |

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): ...
* The following five issues can be designated as essentially uncontested H: ...
* The following issues can potentially be designated as H (although contested): ...
	+ XYZ

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

* XYZ

# Appendix A: ...

# References

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| 1 | [R1-2007748](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2007748.zip) | Maintenance of multi-beam operation | ZTE |
| 2 | [R1-2007749](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2007749.zip) | Draft CR on UL full power transmission Mode 1 | ZTE |
| 3 | [R1-2007750](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2007750.zip) | Maintenance of Multi-TRP enhancements | ZTE |
| 4 | [R1-2007818](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2007818.zip) | Discussion on remaining issues of multi-TRP/panel transmission | CATT |
| 5 | [R1-2007819](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2007819.zip) | Correction on PTRS for UL full power transmission | CATT |
| 6 | R1-2007820 | Remaining Issues on multi-beam operation enhancement | CATT |
| 7 | [R1-2007909](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2007909.zip) | Correction on L1-SINR Resource Setting | FUTUREWEI |
| 8 | [R1-2007938](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2007938.zip) | Corrections to multi TRP | Intel Corporation |
| 9 | [R1-2008093](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2008093.zip) | Discussion on remaining issues for multi-TRP operation | Spreadtrum Communications |
| 10 | [R1-2008094](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2008094.zip) | Discussion on remaining issues on full TX power for UL transmission | Spreadtrum Communications |
| 11 | [R1-2008139](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2008139.zip) | On maintenance of Rel.16 multi-beam operation | Samsung |
| 12 | R1-2008140 | Summary for Rel.16 NR eMIMO maintenance | Moderator (Samsung) |
| 13 | [R1-2008141](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2008141.zip) | On Rel.16 multi-TRP/panel transmission | Samsung |
| 14 | [R1-2008142](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2008142.zip) | On UL full power transmission | Samsung |
| 15 | [R1-2008211](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2008211.zip) | Text proposals for enhancements on multi-TRP and panel Transmission | OPPO |
| 16 | [R1-2008212](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2008212.zip) | Correction for default TCI state of AP CSI-RS for M-TRP | OPPO |
| 17 | [R1-2008213](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2008213.zip) | Text Proposals for Multi-beam Operation Enhancement | OPPO |
| 18 | [R1-2008293](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2008293.zip) | Maintenance on multi-TRP operation | Lenovo, Motorola Mobility |
| 19 | [R1-2008324](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2008324.zip) | Correction on L1-SINR reporting | Huawei, HiSilicon |
| 20 | [R1-2008325](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2008325.zip) | Correction on the maximum number of CORESETs for Multi-DCI Transmission | Huawei, HiSilicon |
| 21 | [R1-2008326](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2008326.zip) | Correction on the index value range of CORESET for Multi-DCI Transmission | Huawei, HiSilicon |
| 22 | R1-2008345 | Remaining issues on multi-beam operation | Sony |
| 23 | [R1-2008436](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2008436.zip) | Remaining issues on Rel-16 Multi-TRP enhancement | Apple |
| 24 | [R1-2008437](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2008437.zip) | Remaining issues on Rel-16 Beam Management | Apple |
| 25 | [R1-2008514](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2008514.zip) | Remaining issues on multi-beam operation | MediaTek Inc. |
| 26 | [R1-2008536](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2008536.zip) | Updated proposal of PUCCH spatial relation after CBRA-BFR in Rel.16 | NTT DOCOMO, INC, Nokia, Nokia Shanghai Bell, InterDigital |
| 27 | [R1-2008569](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2008569.zip) | Corrections on Multi-TRP PDCCH | Quectel |
| 28 | [R1-2008570](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2008570.zip) | Draft CR on multi-TRP/panel transmission | LG Electronics |
| 29 | [R1-2008571](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2008571.zip) | Draft CR on beam management | LG Electronics |
| 30 | [R1-2008572](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2008572.zip) | Text proposals on full Tx power UL transmission | LG Electronics |
| 31 | [R1-2008610](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2008610.zip) | Remaining Issues on Multi-TRP Enhancements | Qualcomm Incorporated |
| 32 | [R1-2008611](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2008611.zip) | Remaining issue on multi-beam operation | Qualcomm Incorporated |
| 33 | [R1-2008635](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2008635.zip) | Draft CR on TCI states for Aperiodic CSI-RS | Ericsson |
| 34 | [R1-2008637](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2008637.zip) | Draft CR on DL SPS based PDSCH repetitions | Ericsson |
| 35 | [R1-2008638](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2008638.zip) | Draft CR on TCI state codepoint mapping for DCI format 1\_2 | Ericsson |
| 36 | [R1-2008640](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2008640.zip) | Draft CR on QCL terminology alignment | Nokia, Nokia Shanghai Bell |
| 37 | [R1-2008641](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2008641.zip) | draft CR on higher layer parameter enabling L1-SINR operation procedures | Nokia, Nokia Shanghai Bell |
| 38 | [R1-2008674](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2008674.zip) | Remaining issues and corrections on multi beam related issues | vivo |
| 39 | [R1-2008675](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2008675.zip) | Corrections on multi TRP related issues | vivo |
| 40 | [R1-2008676](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2008676.zip) | Miscellaneous corrections on power control | vivo |
| 41 | [R1-2008723](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2008723.zip) | Maintenance of Rel-16 Multi-TRP operation | Nokia, Nokia Shanghai Bell |