**3GPP TSG RAN WG1 #109-e R1-2203854**

**e-Meeting, May 9th – 20th, 2022**

**Agenda item:** 8.1

**Source:** Moderator (Samsung)

**Title:** Moderator summary for offline discussion on reply to RAN2 LS R2-2204361

**Document for:** Discussion and Decision

## Introduction

The goal of this offline discussion is to converge on the response to all the topics listed in section 2 as early as possible, preferably before RAN1#109-e starts. This is to facilitate providing a response to RAN2 LS on the maintenance-level RRC issues R2-2204361 [1] by the 2nd day of RAN1#109-e (for RAN2 to complete ASN.1 review).

## Topics raised in R2-2204361

## Topic 1

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| **RRC#1** | **Pathloss Reference RS for BM and PUCCH mTRP**pathlossReferenceRS-Id-r17 was used originally for DLorJoint-TCIState-r17 and PUCCH-PowerControlSetInfo-r17 separately but changed to PUCCH-PathlossReferenceRS-Id/PUSCH-PathlossReferenceRS-Id due to RRC consistency issues. In order to finalize these parameters, it is necessary to know what the maximum number of pathloss Reference RSs is for BM and PUCCH mTRP respectively. In particular, for the unified TCI state, RAN1 agreement "Total of maintained PL-RS per CC is up to 4" is not clear: Does this refer to the maximum amount of configured PL-RS per serving cell? Or what does “maintained” mean in context of RRC configuration? Question 1: What does the RAN1 "Total of maintained PL-RS per CC is up to 4" mean for signalling of PL-RS? Is it relevant for RRC/MAC specification? Please clearly express what is the maximum number of RRC configured Pathloss RS set for 1) unified TCI state and 2) PUCCH power control set? |

**Table 1**

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| **Company** | **Input** |
| Mod V00 | **Provide your inputs along with suggested answers to the questions** |
| Samsung | **Discussion**: For the unified TCI state, per the RAN1 agreement, the total number of maintained pathloss RS is 4 per CC. The maintained pathloss RS are those corresponding to UL or Joint TCI states in the active state (corresponding to TCI state code points activated by MAC CE). Here, ‘maintained’ implies measurement, hence a UE can measure up to 4 RS. For Rel-17, this holds for all UL channels. In Rel-16, the number of RRC configured pathloss RS became up to 64. MAC CE based pathloss update would be supported for SRS and PUSCH and pathloss for PUCCH can be also updated by updating PUCCH-SpatialRelationInfo. In Rel-17, PUCCH-PowerControlSetInfo-r17 was introduced for mTRP PUCCH in FR1. However, the updating pathloss for PUCCH power control set is not supported and the maintained pathloss RS for mTRP PUCCH operation should be up to 4 per CC. Therefore, 4 seems enough for the number of RRC configured Pathloss RS set for PUCCH power control set. **Proposed answer to Question 1**: 4 for both unified TCI and PUCCH PC set.  |
| Apple | Since unified TCI supports FR2, we think the maximum number of PL-RS can be 64. PUCCH PC sets were introduced for mTRP PUCCH for FR1, we think the maximum number of PL-RS can be 8. On top of that, we suggest we add corresponding UE capability.We suggested the following answer:**Proposed answer:** "Total of maintained PL-RS per CC is up to 4" is only related to the pathloss reference signal update delay, which is irrelevant for RRC specification. The maximum number of RRC configured pathloss RS for unified TCI state is 64, and for PUCCH power control set is 8. The maximum number of RRC configured pathloss RS should also be subjected to UE capability. |
| MediaTek | **On Q1:** The maintained PL-RS is the PL-RS UE really needs to perform measurement on, thus the up to 4 maintained PL-RS include at least those PL-RS associated with active joint or UL TCI states. In this sense, the number of configured PL-RS could be larger than the number of maintained PL-RS, and the Rel-16 number can be reused, which is 64. For PUCCH-PowerControlSetInfo-r17 introduced for mTRP PUCCH in FR1, we are fine with 8 since the MAC-CE for PUCCH spatialRelationInfo will be reused. |
| Ericsson | RAN2 has implemented the pathloss RS per UL TCI:UL-TCIState-r17 ::= SEQUENCE { ul-TCIState-Id-r17 UL-TCIState-Id-r17, servingCellId-r17 ServCellIndex  qcl-Type1-r17 QCLUnified-Info-r17, ul-powerControl-r17 Uplink-powerControlId-r17  pathlossReferenceRS-Id-r17 PUSCH-PathlossReferenceRS-Id }Note that RAN2 reuses the PUSCH-PathlossReferenceRS-Id from Rel-15:PUSCH-PathlossReferenceRS-Id ::= INTEGER (0..maxNrofPUSCH-PathlossReferenceRSs-1)wheremaxNrofPUSCH-PathlossReferenceRSs INTEGER ::= 4 This is too small: to obtain the desired functionality, it should be possible to configure different pathloss RS for every UL TCI state. This means that the maximum number of pathloss RSs is the same as the number of UL TCI states, i.e., 64:Note that the UE is only required to maintain (track) the pathloss RSs in the activated TCI states, according to the following agreement from RAN1#105-e:**Agreement**On path-loss measurement for Rel.17 unified TCI framework, a PL-RS (configured for path-loss calculation) is either included in UL TCI state or (if applicable) joint TCI state or associated with UL TCI state or (if applicable) joint TCI state.* Whether a UE supports “beam misalignment or not” (detailed definition FFS) between the DL source RS in the UL or (if applicable) joint TCI state to provide spatial relation indication and the PL-RS is a UE capability
	+ Note: The term “beam misalignment” is for discussion purpose only
* Whether it is ‘included in’ or ‘associated with’ (including the manner it is performed and the signaling) is up to RAN2
* The UE maintains the PL-RS of the activated UL TCI state or (if applicable) joint TCI state
* The maximum number of activated UL TCI states or (if applicable) joint TCI states per band per cell is a UE capability
* FFS: detailed aspects of PL-RS, e.g. CSI-RS type(s), restriction on configuration
* FFS: For the definition of “beam misalignment or not”, at least consider the case where the periodic DL source RS in the UL or (if applicable) joint TCI state to provide spatial relation indication is configured/associated as the PL-RS
* Note: PL-RS is assumed to be periodic

For Rel-17 multi-TRP PUCCH feature, RAN2 has implemented the following:PUCCH-PowerControlSetInfo-r17 ::= SEQUENCE { pucch-PowerControlSetInfoId-r17 PUCCH-PowerControlSetInfoId-r17, p0-PUCCH-Id-r17 P0-PUCCH-Id, pucch-ClosedLoopIndex-r17 ENUMERATED { i0, i1 }, pucch-PathlossReferenceRS-Id-r17 PUCCH-PathlossReferenceRS-Id -- Editor’s Note: Check if new id -r17 is needed to cover full --Editor’s note: to be aligned with the corresponding MAC CE design}PUCCH-PowerControlSetInfoId-r17 ::= INTEGER (1.. maxNrofPowerControlSetInfos-r17)Note that PUCCH-PowerControlSetInfo-r17 was introduced mainly for multi-TRP PUCCH operation in FR1, and the maximum number of power control set Info’s were already agreed to be 8. A typical FR1 operation here is that the UE may be configured with up to 8 PUCCH-PowerControlSetInfo’s corresponding to 8 different TRPs. Among the 8 configured PUCCH-PowerControlSetInfo-r17’s, 2 of them will be activated for a PUCCH resource via a MAC CE. Hence, for the maximum number of RRC configured Pathloss RSs for multi-TRP PUCCH, a maximum value of 8 can be assumed which corresponds to up to 8 different TRPs.Answer to Q1: The maximum number of pathloss RSs for unified TCI is 64. The maximum number of pathloss reference RSs for multi-TRP PUCCH operation in FR1 is 8. |
| LG | We think that we first need to explain the meaning of “maintained PL-RS” to RAN2, e.g. ‘It corresponds to the total number of actual RSs on which UE measures pathloss for PUSCH, PUCCH and SRS. NW can configure more than 4 PL RS by RRC, and in this case, UE does not required to measure/calculate pathloss for all RRC configured PL RSs. Thus, it is not relevant to the number of RRC configured PL RSs’.With this, we are also fine to support 64 RRC configured PL RSs as Rel-16 for unified TCI. Regarding the maximum number of pathloss reference RSs for multi-TRP PUCCH operation in FR1, up to 8 is sufficient given than up to 8 PUCCH-PowerControlSetInfo-r17 can be RRC configured. |
| Lenovo | The number of active PL-RS for unified TCI state or PUCCH is the number of PL-RS that the UE needs to actively measure. It is only the subset of configured PL-RS that is activated by MAC-CE. For monitoring and measuring PL point of view, 8 in a CC is required for FR1 to give each UL or joint TCI state an independent PL-RS. The total number of configured PL-RS shall remain at 64.  |
| QC | **Proposed answer to Question 1**: For unified TCI, maintained PL RS means the PL RS associated with activated TCI. Maximum number of configured PL RS should be 4 per CC, to match the total maintained PL RS #. For PUCCH power control set in FR1 (for mTRP PUCCH), the maximum number of RRC configured Pathloss RS is 8. |
| OPPO | **Discussion**: For the unified TCI state of Rel-17, the UE needs to maintain the PL-RSs that are associated with the (1) the TCI states activated by MAC CE for Rel-17 DCI-based indication and also the (2) Joint or UL TCI states configured to SRS resources that are not configured to follow DCI-indicated TCI states. And 4 is the maximal number of those PL-RSs. For unified TCI framework, RRC can configure more than 4 PL-RS but the ‘active’ PL-RSs shall be limited to be 4.For the PUCCH PC set: the PL-RS configured in RRC would be part of the PL-RSs that shall be maintained by the UE. Thus the maximal number is PL-RS shall be limited to 4.**Proposed answer**: For the unified TCI framework of Rel-17, the “Total of maintained PL-RS per CC is up to 4” means the PL-RS associated with activated joint or UL TCI-States and also the joint/UL TCI-state configured/indicated to the SRS resources not configured to follow rel-17 DCI-indicated TCI states. Thus, for unified TCI framework, the number of PL-RS configured in RRC is not limited to 4 and the UE is not required to maintain the PL-RS configured in RRC. But for PUCCH PC set, the PL-RS in RRC shall be limited to be 4. |
| vivo | According to RAN1 agreement, for path-loss measurement in Rel.17 unified TCI framework, a PL-RS (configured for path-loss calculation) is either included in or associated with UL TCI state or (if applicable) joint TCI state. The UE maintains the PL-RS of the activated UL TCI state or (if applicable) joint TCI state.The maximum number of RRC configured PL-RSs for SRS/PUCCH/PUSCH power control in Rel-16 can be reused, i.e. 64 in Pathloss RS set, where each PL-RS is included in or associated with UL TCI state or joint TCI state.The existing restriction can be reused in Rel-17, i.e. the UE does not expect to simultaneously maintain more than 4 pathloss estimates per serving cell for all PUSCH/PUCCH/SRS transmissions, which means the maximum number of activated UL TCI states or joint TCI states cannot exceed 4 per serving cell. If the UE is provided a number of RS resources for pathloss estimation for PUSCH/PUCCH/SRS transmissions that is larger than 4, the UE maintains for pathloss estimation RS resources corresponding to RS resource indices as described in clauses 7.1.1, 7.2.1, and 7.3.1 in TS 38.213.The maximum number of RRC configured Pathloss RS set for PUCCH power control set is 8. |
| ZTE | As mentioned by other companies, the maximum number of pathloss RS should be aligned with that of candidate TCI state/spatial filter. In other words, we should have a complete pool for all candidate beams, and then in MAC-CE or DCI level, we will do the down-selection. After that, for maintaining PL-RS, it is just relevant to MAC-CE activated PL-RS(s) implicitly by unified TCI activation. We are open to further consider more than 4 maintained PL-RS.Then, for Rel-17 PUCCH operation, since the MAC-CE is only applied to FR1, rather than both FR2 and FR1. So up to 8 should be sufficient.**Proposed reply:** "Total of maintained PL-RS per CC is up to 4" is not relevant to RRC configuration but for restricting the maximum number of activated PL-RS determined by unified TCI MAC-CE. Then, the maximum number of PL-RSs for unified TCI should be 64, and the maximum number of PL-RSs for Rel-17 multi-TRP PUCCH operation in FR1 is 8. |
| Huawei, Hisilicon | The maintained PL-RS is the pathloss RS that UE will measure, which are those associated with activated TCI states by MAC-CE and those associated with SRS when it doesn’t share the same unified TCI as PUSCH/PUCCH. The number is up to 4 according to RAN1 agreement. On the maximum number of RRC configured pathloss RS, prefer to reuse 64 as Rel-16 for both unified TCI state and PUCCH PC set. gNB can ensure that the number of maintained pathloss RS is no larger than 4 by implementation, e.g., the total number of different pathloss RS corresponding to activated unified TCI states and pathloss RS corresponding to PUCCH resources is no larger than 4. |
| Spreadtrum | We have similar understanding as other companies, the maintained PL-RS is the PL-RS which need to be tracked by UE. Different from the number of maintained PL-RS, the number of RRC configured PL-RS can be larger. We are OK to support up to 64 RRC configured PL-RS.Regarding the max number of PL-RS for multi-TRP PUCCH operation in FR1, 8 should be enough since up to 8 PUCCH-PowerControlSetInfo-r17 can be RRC configured. |
| NTT DOCOMO | **Question 1**: The maintained PL-RS is the PL-RS which UE actually tracks, and it is not related to the max number of RRC configured PL-RSs. In Rel.16, UE can be configured up to 64 PL-RS by RRC, but UE still needs to “maintain” up to 4 PL-RS. From signaling perspective, it is possible to configure different PL-RS for every joint/UL TCI state. Hence, up to 64 PL-RSs is required. For PUCCH power control set (i.e., mTRP PUCCH in FR1), the maximum number of RRC configured Pathloss RS is 8. |
| Futurewei | We share the same view as other companies that the maintained PL-RS is the PL-RS on which the UE performs measurement and tracking. The maintained PL-RSs are associated with active joint or UL TCI states and are a subset of the RRC configured PL-RS set. The maximum number of RRC configured PL-RS is 64.  |
| Intel  | The “maintained PL-RS per CC” means the total number of PL-RS that is associated with activated TCI-states that the UE is performing measurements on for power control purposes. This number is 4 per CC. The maximum number of RRC configured PL-RS can be 64 which also aligns with the max. number of RRC configured TCI-states. The maximum number of PUCCH power control set is 8 as we agreed – and the purpose of this was to allow some flexibility for mTRP power control in FR1 (without the need for QCL-Type D) |
| Mod V19 | **Comment:** Based on the comments from the super-majority of companies, it seems clear that “4” has nothing to do with RRC spec (perhaps RAN4 since it’s clearly related to measurement). Re the max number of RRC-configured PL-RSs* For unified TCI it is clear that it should be the same as the number of RRC-configured UL/joint TCI states
* For PUCCH, the question indicates that this is for mTRP operation (RAN1 old AI 8.1.2.1, not for 8.1.1 – which seems to be misunderstood by some companies). See, e.g. Ericsson’s input.

**Moderator proposal for answer to question** 1: “Total of maintained PL-RS per CC is up to 4” is only related to PL-RS measurement associated with activated UL or, if applicable, joint TCI states. It is irrelevant to RRC specification. The maximum number of RRC-configured PL-RS for unified TCI state is 64 (the same as the maximum number of RRC-configured UL TCI states). The maximum number of RRC-configured PL-RS for PUCCH PC set (multi-TRP PUCCH operation) in FR1 is 8.  |
| Mod V27 | No revision from V19 |

## Topic 2

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| **RRC#2** | **sfnScheme-r17 and sfnSchemePdsch-r17 in HST** RAN1 indicates sfnScheme-r17 and sfnSchemePdsch-r17 as per BWP. However, there is a note that “In Rel-17, all downlink BWPs (except initial BWP and FFS: BWP-DownlinkCommon) within a CC should have the same configuration of SFN scheme”. In addition, it is not clear whether PDSCH and PDCCH can have different SFN schemes in the same serving cell?Question 2: RAN2 has currently defined sfnScheme-r17 as part of PDCCH-Config and sfnSchemePdsch-r17 as part of PDSCH-Config, which are per BWP. But since the values are the same for all BWPs, a more efficient signalling would be to define them per serving cell. Is there a reason why the configuration needs to be per BWP?Question 3: Can PDSCH and PDCCH use different SFN schemes in the same serving cell, e.g. can PDCCH use sfnSchemeA and PDSCH sfnSchemeB for the same BWP? |

**Table 2**

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| **Company** | **Input** |
| Mod V00 | **Provide your inputs along with suggested answers to the questions** |
| Samsung | **Discussion:** PDSCH and PDCCH cannot have different SFN schemes (sfnSchemeA or sfnSchemeB) in one CC per the following agreements (which also confirm per CC configuration):**Agreement in RAN1#105-e*** For TRP-based pre-compensation QCL assumptions is provided to the UE by using the existing QCL type(s) with certain QCL parameters dropped from the indicted QCL type
	+ FFS rule or signalling to determine which TCI state with dropped QCL parameters
* UE does not expect to be configured different SFN schemes (scheme 1 or TRP pre-compensation) for both PDCCH and PDSCH.
	+ FFS whether this restriction is per UE or per CC
* UE does not expect to be configured different SFN schemes (scheme 1 or TRP pre-compensation) for different CORESETs.
	+ FFS whether this restriction is per UE or per CC

**Agreement in RAN1#106b-e**Enhanced SFN (scheme 1 or TRP-based pre-compensation scheme) for PDCCH and PDSCH is configured by using separate per-BWP RRC parameters* In Rel-17, all downlink BWPs (except initial BWP and FFS: BWP-DownlinkCommon) within a CC should be the same configuration of SFN scheme

**Proposed answer to Question 2**: The configuration of SFN scheme is per BWP RRC parameter since the transmission scheme has been agreed per BWP configuration (within PDSCH-config for sfnSchemePdsch-r17 and within PDCCH-config for sfnScheme-r17).**Proposed answer to Question 3**: Although separate per-BWP RRC parameter for PDCCH and PDSCH has been agreed (hence it is possible to have independent configuration for PDSCH and PDCCH), it has also been agreed that PDSCH and PDCCH cannot have different SFN schemes (sfnSchemeA or sfnSchemeB) in one CC. Therefore this constraint should be reflected in the description of the RRC parameter |
| Apple | **Question 2:** We do not see technique reason why the configuration cannot be implemented in RAN2 as per serving cell. However, in order to respect the agreement, we are fine with either way, i.e., (1) per BWP configuration with restriction captured in 38.331 or (2) per serving cell configuration.**Question 3:** Based on the following agreement, NW cannot configure different HST-SFN scheme (sfnSchemeA or sfnSchemeB) for PDCCH and PDSCH. The restriction is not for the same CC, but also across different CCs in the same band**Agreement in RAN1#107-e**For intra-band CA, UE doesn’t expect configurations of different SFN schemes in different CCs |
| MediaTek | **On Q2:** We are fine either per BWP configuration but with restriction captured in 331 spec or serving cell configuration. Decision on one of them can be up to RAN2.**On Q3:** No, it can’t.  |
| Ericsson | **Answer to Q2**: Per BWP can provide better configuration flexibility if a UE also support BWP switch and is better forward compatible.**Answer to Q3:** If SFN scheme is configured for both PDSCH and PDCCH, same SFN scheme shall be applied. SFN schemeA can be configured for PDSCH only (with S-TRP PDCCH), or PDCCH only (with S-TRP PDSCH); SFN scheme B can be configured for PDSCH only. |
| LG | We are ok with Samsung’s proposed answer for Q2 and Q3 |
| Lenovo | **Question 1:** Agree Samsung’s view. PDSCH and PDCCH cannot have different SFN schemes (sfnSchemeA or sfnSchemeB) in one CC based on RAN1 agreement. Actually we think they need to be the same in a band.**Question 2:** Agree Samsung’s view. It is agreed as per BWP configuration with consideration of flexibility (e.g. initial BWP) and compatibility of existed per BWP signalling structure for *PDSCH-config* and *PDCCH-config*. However, we do not see a technical issue with per-CC configuration support**Question 3:** Different HST-SFN scheme (sfnSchemeA or sfnSchemeB) cannot be configured for PDCCH and PDSCH in the same serving cell based on RAN1 agreement. |
| Qualcomm | **Proposed answer to Question 2:** Per-BWP configuration was a compromise solution. In principle, BWP switch shouldn’t change the SFN scheme, that is why the restriction of same configuration across BWPs. There is no technical reason justifying why per-cell configuration wouldn’t work. **Proposed answer to Question 3:** PDSCH and PDCCH cannot be configured with different SFN schemes in the same serving cell. The independent configuration of per-BWP RRC parameter was adopted to give flexibility of configuring SFN scheme for PDCCH only or PDSCH only (e.g. nonSFN PDCCH + SFN PDSCH or SFN PDCCH + nonSFN PDSCH). However, If SFN is configured for both PDSCH and PDCCH, then the same SFN scheme ‘sfnSchemeA’ or ‘sfnSchemeB’ should be configured for both PDCCH and PDSCH,  |
| OPPO | **Question 2:** Based on the RAN1 agreement, the parameter is per BWP basis. Technically speaking, we think it can be per cell configuration, if companies are fine. **Question 3:** Based on the RAN1 agreement, for intra-band CA, the same SFN scheme should be configured for PDCCH and PDSCH.  |
| vivo | **Answer to Question 2:** Regarding Rel-16 MTRP schemes, they are configured per BWP in PDSCH-config. Therefore, it is natural to configure SFN schemes per BWP as a parallel MTRP solution. The reason to restrict the same SFN schemes in all BWPs in RAN1 is to avoid the dynamic switching of SFN schemeA and schemeB when the active BWP is switched by DCI. Moreover, it is allowed that UE can work with STRP-based PDSCH in some BWPs if UE supports the dynamic switching between STRP and SFN transmission. From this perspective, it is clearer and simpler to configure the SFN scheme per BWP than per CC.**Answer to Question 3:** No. RAN1 has agreed that SFN-based PDSCH and PDCCH should be configured as the same SFN scheme. That would reduce UE’s complexity, since the reception process is quite different for SFN schemeA and schemeB, e.g., channel estimation. |
| ZTE | **On Q2:** Technical speaking, either way should be fine. But, considering forward compatibility, we share the same views with Ericsson that Per-BWP + restriction is better.**On Q2:** No, it can’t. |
| Huawei, Hisilicon | **For question 2:** In practice, the network may use only a single bandwidth part for SFN scheme while other BWPs still use single-TRP, so if the configuration of SFN scheme is per CC, which results in unnecessary network overhead and UE complexity. Therefore, it’s per-BWP configuration following the agreement:**Agreement in RAN1#106b-e**Enhanced SFN (scheme 1 or TRP-based pre-compensation scheme) for PDCCH and PDSCH is configured by using separate per-BWP RRC parameters* In Rel-17, all downlink BWPs (except initial BWP and FFS: BWP-DownlinkCommon) within a CC should be the same configuration of SFN scheme

**For question 3**: PDSCH and PDCCH can’t have different SFN schemes as the following agreement.**Agreement in RAN1#105-e*** For TRP-based pre-compensation QCL assumptions is provided to the UE by using the existing QCL type(s) with certain QCL parameters dropped from the indicted QCL type
	+ FFS rule or signalling to determine which TCI state with dropped QCL parameters
* UE does not expect to be configured different SFN schemes (scheme 1 or TRP pre-compensation) for both PDCCH and PDSCH.
	+ FFS whether this restriction is per UE or per CC
* UE does not expect to be configured different SFN schemes (scheme 1 or TRP pre-compensation) for different CORESETs.
	+ FFS whether this restriction is per UE or per CC
 |
| Spreadtrum | **Question 2:** per BWP configuration based on RAN1 agreements. But from the technical perspective, we are also fine with per cell.**Question 3:** No. They should be the same based on RAN1 agreements and TS 38.214. |
| NTT DOCOMO | **Question 2:** Based on the RAN1 agreement, the parameter is configured per BWP basis. But, it is up to RAN2 how to implement it. It is also OK to implement the parameter per CC. Indeed, we think it is more efficient to configure the parameter per CC from signaling perspective. But, please note the parameter of PDCCH and the parameter of PDSCH should be configured separately, because it is possible to configure SFN to either PDCCH or PDSCH. **Question 3:** No, it is not allowed. |
| Futurewei | **Question 2:** per BWP. We’d like to follow the existing agreement as much as possible.**Question 3:** No (given RAN1 agreement). |
| Intel | Q2: yes, this was part of a compromise in RAN1 so perhaps better to keep implementation as per RAN1 agreement without any further optimization in RAN2 (agree with FL)Q3: PDSCH and PDCCH cannot use different SFN configurations. |
| Mod V19 | **Comment:** Based on the comments from companies, * Q2. RAN1 agrees to per BWP. The restriction (same value across all BWPs) can be captured
* Q3. It’s clear that RAN1 has agreed that PDSCH and PDCCH cannot use different schemes in the same BWP

**Moderator proposal for answer to question 2**: In accordance to RAN1 agreements, the configuration of SFN scheme is per BWP. The restriction (same value for all BWPs) can be captured in 38.331**Moderator proposal for answer to question 3**: Per RAN1 agreement, it cannot. |
| Mod V27 | No revision from V19 |

## Topic 3

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| **RRC#3** | **CSI-mTRP** RAN2 introduced 2 types of RI restrictions and two codebook subset restrictions (CBSR) per CodebookConfig. However, it is not clear how those features are enabled: Currently, same as in previous releases, RAN2 signalling assumes both RI restrictions and CBSR are configured simultaneously, but RAN2 would like to verify this is the correct assumption for the signallling.Question 4: Which of the following assumptions are correct? * [Assumption 1] If two RI restrictions are configured, two CBSRs are configured and if two CBSRs are configured two CBSRs are configured (i.e. when two are configured for either RI restriction or CBSR, two are also configured for the other).
* [Assumption 2] UE can be configured with either RI restriction for sTRP or RI restriction for NCJT, but not both at the same time.
* [Assumption 3] If two CBSRs are configured, two CMR groups are configured and if two CMR groups are configured, two CBSRs are configured (i.e. when two are configured for either CBSR or CMR groups, two are also configured for the other and there cannot be configuration of e.g. one CBSR but two CMR groups)
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**Table 3**

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| **Company** | **Input** |
| Mod V00 | **Provide your inputs along with suggested answers to the questions** |
| Samsung | **Proposed answer to question 4*** Assumption 1 is correct
* Assumption 2 is incorrect since RI restrictions for both sTRP and NCJT may or may not be configured simultaneously
* Assumption 3 is correct
 |
| Apple | **Assumption 1:** In our view, like the legacy Type I codebook CSI configuration, for the enhanced CSI report for mTRP NCJT with Type I codebook, NW can be mandated to configure two RI restrictions and two CBSR restrictions **Assumption 2:** Not correct, UE can be configured with both at the same time.**Assumption 3:** Correct understanding. |
| MediaTek | Assumption 1: Correct understanding.Assumption 2: Not correct, same view with SS and Apple.Assumption 3: Correct understanding. |
| Ericsson | **Answer to Q4-1:**It is not necessary that two RI restrictions are configured if two CBSRs are configured. For instance, when CSI report mode 1 with X=0 is configured in a CSI Report Config, then the UE only reports NC-JT CSI. In this case, it is sufficient that only the RI restriction corresponding to NC-JT (i.e., typeI-SinglePanel-ri-RestrictionSDM-r17) is configured while two CBSRs are configured. When CSI report mode 1 with X = 1 or 2, or in the case of CSI report mode 2, configuration of two RI restrictions with two CBSRs is a valid configuration.**Answer to Q4-2:**It is possible that the UE can be configured with any of the following: (1) RI restriction for sTRP, (2) RI restriction for NCJT, (3) RI restrictions for both sTRP and NCJT. For instance, when CSI report mode 1 with X = 0 is configured, then it is enough to configure the RI restriction for NCJT. When CSI report mode 1 with X = 1 or 2 or when CSI report mode 2 is configured, then RI restrictions for both sTRP and NCJT can be configured.**Answer to Q4-3:**The following are valid:  (1) if two CBSRs are configured, two CMR groups are configured, and (2) if two CMR groups are configured, two CBSRs are configured. |
| LG | We are ok with Samsung’s proposed answer  |
| Lenovo | **Answer to Question 4:**- Assumption 1 is incorrect. If two CMR groups are configured:* two CBSRs are always configured.
* **And** RRC parameter pair *csi-ReportMode-r17*, *numberOfSingleTRP-CSI-Mode1-r17* are set to{‘Mode1’, ‘n0’}, one RI restriction (for NCJT) is configured
* **And** RRC parameter pair *csi-ReportMode-r17, numberOfSingleTRP-CSI-Mode1-r17* are set to any value pair other than {‘Mode1’,’n0’}, two RI restrictions (for both sTRP and NCJT) are configured

- Assumption 2 is incorrect. UE is configured with one RI restriction for NCJT if *csi-ReportMode-r17* is set to ‘Mode1’ **and** *numberOfSingleTRP-CSI-Mode1 –r17* is set to ‘n0’, otherwise UE is configured with two RI restrictions for both sTRP and NCJT- Assumption 3 is correct.  |
| QC | **Proposed answer to question 4*** Assumption 1 is correct
* Assumption 2 is incorrect. In fact, both RI restriction for sTRP and RI restriction for NCJT should be configured at the same time (for sTRP CSI hypotheses and NCJT CSI hypotheses, respectively) when two CMR groups are configured (expect for the case of *csi-ReportMode-r17* is set to ‘Mode1’ **and** *numberOfSingleTRP-CSI-Mode1 –r17* is set to ‘n0’ in which case RI restriction for NCJT is enough)
* Assumption 3 is correct
 |
| OPPO | We think Assumption 1 and 3 are correct, and Assumption 2 is incorrect.  |
| Vivo | Assuming the first assumption is:- If two RI restrictions are configured, two CBSRs are configured and if two CBSRs are configured two ~~CBSRs~~RI restrictions are configured (i.e. when two are configured for either RI restriction or CBSR, two are also configured for the other).Following is our understanding which is better to be included in the LS reply to make it clear:* Configuration of RI restrictions is irrelevant to configuration of CBSRs.
* As CBSR is always configured in Rel-15/16 codebook types, for Rel-17 codebook type when two CMR groups are configured it is fine to always configure two CBSRs, each associated with one CMR group.

When csi-ReportMode-r17 is set to ‘Mode1’ and numberOfSingleTRP-CSI-Mode1-r17 is set to ‘n0’, there is no need to configure typeI-SinglePanel-ri-RestrictionSTRP-r17, otherwise, two RI restrictions should be configured. |
| ZTE | Same view with Ericsson |
| Huawei, HiSilicon | • For assumption 1, we are not exactly sure about the question. If two RI restrictions are configured, (i.e. one of two restrictions is configured for all NCJT measurement hypotheses), two CBSR can be configured regardless whether two CBSRs are the same or not, or no CBSR are configured. For the latter, the UE only takes RI restrictions when determining reported PMI. • For assumption 2, it is incorrect. Each RI restriction is dedicated for either single-TRP measurement hypotheses or NCJT measurement hypotheses (two type measurements are orthogonal each other). There is no crossover among two RI restrictions and two types of measurement hypotheses. • For assumption 3, it is correct. No further optimization of configuring one CBSR only, or one RI restriction only, or one CMR group only, applied for a CSI report that intends to do NCJT measurement. |
| Spreadtrum | Assumption 1: Correct. Assumption 2: Not correct. Assumption 3: Correct. |
| NTT DOCOMO | Agree with Ericsson’s answer. |
| Futurewei | Assumption 1: As commented by other companies, it is not necessary that when two are configured for either RI restriction or CBSR, two are also configured for the other.Assumption 2: Incorrect.Assumption 3: Correct. |
| Mod V19 | **Comment:** Based on the comments from the super-majority of companies, the answer below seems acceptable. Note that assumption 1 as stated in question 4 should be reworded as follows since RI restriction and CBSR are (have been, since Rel-15 or even LTE) two independent features:“If two RI restrictions are configured, two CBSRs *~~are~~ can be* configured and if two CBSRs are configured two *~~CBSRs~~ RI restrictions* *~~are~~ can be* configured (i.e. when two are configured for either RI restriction or CBSR, two *~~are~~ can also be, but are not necessarily* configured for the other).”**Moderator proposal for answer to question 4**: * The following revision of Assumption 1 is correct (the original formulation from RAN2 lacks precision):

“If two RI restrictions are configured, two CBSRs *~~are~~ can be* configured and if two CBSRs are configured two *~~CBSRs~~ RI restrictions* *~~are~~ can be* configured (i.e. when two are configured for either RI restriction or CBSR, two *~~are~~ can also be, but are not necessarily* configured for the other).* + RI restriction and CBSR are two independent features”
* Assumption 2 is incorrect
* Assumption 3 is correct
 |
| Mod V27 | No revision from V19 |
| vivo | We agree with Moderator proposal in principle, and prefer to add some details for Assumption 2 based on some companies’ comments to make it clear. Please check if it is necessary.* Assumption 2 is incorrect. UE is configured with one RI restriction for NCJT if csi-ReportMode-r17 is set to ‘Mode1’ and numberOfSingleTRP-CSI-Mode1-r17 is set to ‘n0’, otherwise UE is configured with two RI restrictions for sTRP and NCJT respectively.
 |
| Mod V28 | **Comment:** Although the additional explanation on assumption 2 from vivo isn’t needed, it is correct and can be helpful to RAN2**Moderator proposal for answer to question 4**: * The following revision of Assumption 1 is correct (the original formulation from RAN2 lacks precision):

“If two RI restrictions are configured, two CBSRs *~~are~~ can be* configured and if two CBSRs are configured two *~~CBSRs~~ RI restrictions* *~~are~~ can be* configured (i.e. when two are configured for either RI restriction or CBSR, two *~~are~~ can also be, but are not necessarily* configured for the other).* + RI restriction and CBSR are two independent features”
* Assumption 2 is incorrect.
	+ UE is configured with one RI restriction for NCJT if csi-ReportMode-r17 is set to ‘Mode1’ and numberOfSingleTRP-CSI-Mode1-r17 is set to ‘n0’, otherwise UE is configured with two RI restrictions for sTRP and NCJT respectively.
* Assumption 3 is correct
 |

## Topic 4

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| **RRC #4****[2]** | There are several parameters to support mTRP PUSCH (i.e. PUSCH repetition). RAN2 configuration assumes those parameters are only configured when two SRS resource sets are configured and the *usage in SRS-Config* is set to *codebook* or *noncodebook*. However, it is not clear the what "two SRS resource sets" means since in Rel-15/16 up to SRS resource sets can be configured and there are separate lists of SRS resource sets for DCI formats 0\_1 and 0\_2, as shown below. RAN2 would need to know this to set the configuration constraints correctly.    srs-ResourceSetToAddModList             SEQUENCE (SIZE(1..maxNrofSRS-ResourceSets)) OF SRS-ResourceSet                  OPTIONAL,   -- Need N    srs-ResourceSetToAddModListDCI-0-2-r16  SEQUENCE (SIZE(1..maxNrofSRS-ResourceSets)) OF SRS-ResourceSet          OPTIONAL, -- Need N**Question 5:** When mTRP PUSCH repetition is used, what is the definition of "two SRS resource sets" being used? Can those be SRS resource sets as in the Rel-15/16 configuration, or are those only configured with Rel-17 fields? |

**Table 4**

|  |  |
| --- | --- |
| **Company** | **Input** |
| Mod V00 | **Provide your inputs along with suggested answers to the questions** |
| Samsung | **Discussion:** Until Rel-16, only one SRS resource set for codebook or noncodebook can be configured in ResourceSetToAddModList or ResourceSetToAddModListDCI-0-2. “two SRS resource sets” means two SRS resource sets with usage set to ‘codebook’ or ‘nonCodebook’ (not for other usage like ‘antennaSwitching’ or ‘beamManagement’) can be configured in srs-ResourceSetToAddModList or srs-ResourceSetToAddModListDCI-0-2.**Proposed answer to question 5**: “two SRS resource sets” means that two SRS resource sets can be configured in srs-ResourceSetToAddModList or srs-ResourceSetToAddModListDCI-0-2 (usage = ‘codebook’ or ‘nonCodebook’) in Rel-17. |
| Apple | Agree with Samsung’s proposed answer. |
| MediaTek | Okay to the proposed answer from Samsung |
| Ericsson | **Answer to Q5:**When mTRP PUSCH repetition is used, the two SRS resource sets being configured are with either usage ‘codebook’ or ‘nonCodebook’. Up to Rel-16, RAN1 specifications limited the maximum number of SRS resource sets with either usage ‘codebook’ or ‘nonCodebook’ to be 1. In Rel-17, RAN1 specifications allow the maximum number of SRS resource sets with either usage ‘codebook’ or ‘nonCodebook’ to be 2. From ASN.1 perspective, the two SRS resource sets can be those SRS resource sets as in Rel-15/16 Configuration. |
| LG | We are ok with Samsung’s proposed answer  |
| Lenovo | Agree with Samsung’s proposed answer. |
| QC | **Proposed answer to question 5**: The “two SRS resource sets” should have usage = ‘codebook’ or ‘nonCodebook’ and they are both in the same list, i.e., either configured in ResourceSetToAddModList or in ResourceSetToAddModListDCI-0-2. Without Rel-17 mTRP PUSCH repetition, only one SRS resource set can be configured per list with usage = ‘codebook’ or ‘nonCodebook’. |
| OPPO | Ok with the answer proposed by Samsung |
| vivo | Agree with Samsung’s proposed answer. |
| ZTE | Either Samsung or Ericsson are okay for us. |
| Huawei, HiSilicon | Fine with Samsung’s proposed answer. It may still be confusing for RAN2 on whether total number of SRS resource sets configured in both srs-ResourceSetToAddModList or srs-ResourceSetToAddModListDCI-0-2, and with usage = both ‘codebook’ and ‘nonCodebook’. Perhaps it can be listed as:* Two SRS resource sets in srs-ResourceSetToAddModList with usage = ‘codebook’
* Two SRS resource sets in srs-ResourceSetToAddModList with usage = ‘nonCodebook’
* Two SRS resource sets in srs-ResourceSetToAddModList-0-2 with usage = ‘codebook’
* Two SRS resource sets in srs-ResourceSetToAddModList-0-2 with usage = ‘nonCodebook’
 |
| Spreadtrum | Agree with Samsung’s proposed answer, Huawei’s clarification is also fine for us. |
| NTT DOCOMO | OK with Samsung’s proposed answer. |
| Futurewei | Same view as Samsung/QC/Huawei. To be absolutely clear, RAN1 may suggest:R15/16:* Up to one SRS resource set in srs-ResourceSetToAddModList with usage = ‘codebook’
* Up to one SRS resource set in srs-ResourceSetToAddModList with usage = ‘nonCodebook’
* Up to one SRS resource set in srs-ResourceSetToAddModList-0-2 with usage = ‘codebook’
* Up to one SRS resource set in srs-ResourceSetToAddModList-0-2 with usage = ‘nonCodebook’

R17:* Up to two SRS resource sets in srs-ResourceSetToAddModList with usage = ‘codebook’
* Up to two SRS resource sets in srs-ResourceSetToAddModList with usage = ‘nonCodebook’
* Up to two SRS resource sets in srs-ResourceSetToAddModList-0-2 with usage = ‘codebook’
* Up to two SRS resource sets in srs-ResourceSetToAddModList-0-2 with usage = ‘nonCodebook’
 |
| Intel | Fine with FL answer but we can also clarify that SRS resource sets configuration can be the same as in Rel-15/16 configuration (no Rel-17 fields are needed) but the number is now increased to 2 (instead of 1) |
| Mod V19 | **Comment:** Based on the comments from the super-majority of companies, while Samsung’s formulation is acceptable, Huawei’s formulation is much clearer (albeit equivalent) and leaves no room for ambiguity. **Moderator proposal for answer to question 5**: When Rel-17 mTRP PUSCH repetition is used, “two SRS resource sets” comprises one of the following options:* Two SRS resource sets in srs-ResourceSetToAddModList with usage = ‘codebook’
* Two SRS resource sets in srs-ResourceSetToAddModList with usage = ‘nonCodebook’
* Two SRS resource sets in srs-ResourceSetToAddModList-0-2 with usage = ‘codebook’
* Two SRS resource sets in srs-ResourceSetToAddModList-0-2 with usage = ‘nonCodebook’
 |
| Mod V27 | No revision from V19 |
| vivo | We think it is more precise to adjust the reason (two SRS resource sets) and consequence (Rel-17 mTRP PUSCH repetition is used) for better understanding.When “two SRS resource sets” comprising one of the following options are configured, Rel-17 mTRP PUSCH repetition ~~is used~~ can be applied, ~~“two SRS resource sets” comprises one of the following options~~:* Two SRS resource sets in srs-ResourceSetToAddModList with usage = ‘codebook’
* Two SRS resource sets in srs-ResourceSetToAddModList with usage = ‘nonCodebook’
* Two SRS resource sets in srs-ResourceSetToAddModList-0-2 with usage = ‘codebook’
* Two SRS resource sets in srs-ResourceSetToAddModList-0-2 with usage = ‘nonCodebook’
 |
| Mod V28 | **Comment:** After further checking, it seems vivo’s formulation (reversing the “if ... then ...”) is accurate. In addition, the suggestion from Intel and Futurewei can add clarity. **Moderator proposal for answer to question 5**: When “two SRS resource sets” are configured in one of the following settings, the Rel-17 mTRP PUSCH repetition can be applied:* Two SRS resource sets in srs-ResourceSetToAddModList with usage = ‘codebook’
* Two SRS resource sets in srs-ResourceSetToAddModList with usage = ‘nonCodebook’
* Two SRS resource sets in srs-ResourceSetToAddModList-0-2 with usage = ‘codebook’
* Two SRS resource sets in srs-ResourceSetToAddModList-0-2 with usage = ‘nonCodebook’

In Rel-15/16, only up to one SRS resource set can be configured in each of the above four settings. |

## Topic 5

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| **RRC#5** | The Rel-17 parameter *ul-powerControl-r17* configures power control parameters for PUCCH, PUSCH and SRS when UE is configured with unified TCI state. Current RRC enables the configuration in a dedicated UL BWP and also in configured unified TCI states that contains UL (i.e. joint or UL TCI state). Hence the current field description states:***ul-powerControl***Configures power control parameters for PUCCH, PUSCH and SRS when UE is configured with unifiedtci-StateType .The field is present here only if UL power control is not configured for any UL TCI state and DLorJoint-TCIState.However, as it is understood that UE can be configured only with unified TCI state or Rel-15/16 TCI state framework, it is not clear if can be configured with Rel-15/16 power control parameters when UE is configured with parameter *ul-powerControl-r17*.**Question 6:** Is the UE always configured with parameter *ul-powerControl-r17* when the UE is configured with unified TCI states? If yes, will the UE use a Rel-15/16 UL power control configuration when the UE is configured with unified TCI states?  |

**Table 5**

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| **Company** | **Input** |
| Mod V00 | **Provide your inputs along with suggested answers to the questions** |
| Samsung | **Discussion:** When a UE is configured to use the unified TCI state, the UE is configured ul-powerControl in BWP-UplinkDedicated and can be configured with ul-powerControl in DLorJointTCIState and, if applicable, UL-TCIState. If a UE is not configured with ul-powerControl in a DLorJointTCIState or a UL-TCIState, the UE derives the power control parameters from the ul-powerControl parameter that is configured in BWP-UplinkDedicated, when the respective TCI state (without ul-powerControl parameter) is indicated or configured for an UL channel or signal. The Rel-15/16 power control configurations are not used when the unified TCI state is configured.**Proposed answer to question 6**: Yes, the UE is always configured with parameter ul-powerControl-r17 in BWP-UplinkDedicated or, optionally, in DLorJointTCIState/UL-TCIState. In this case, the UE will not use a Rel-15/16 UL PC configuration.  |
| Apple | Agree with Samsung’s proposed answer. |
| MediaTek | Okay to the proposed answer from Samsung |
| Ericsson | When unified TCI is configured, the power control parameters, including the pathloss RS, are associated with the TCI state. In legacy, another paradigm is used. Since the two solutions are not to be used in parallel, the corresponding parameters should only be configured in either framework.We are fine with the proposed answer from Samsung. |
| LG | We are ok with Samsung’s proposed answer  |
| Lenovo | In our understanding, the ul-powerControl configured in BWP-UplinkDedicated can only be referred to from DLorJointTCIState/UL-TCIState. That implies if no ul-powerControl is configured in DLorJointTCIState/UL-TCIState, the ul-powerControl configured in BWP-UplinkDedicated cannot be used as default values. There is no way for UE to tell these values are used for which channel: PUSCH, PUCCH or SRS. Based on this understanding, this is our proposed answer:UE is always configured with parameter *ul-powerControl-r17* when the UE is configured with unified TCI states. UE will not use a Rel-15/16 UL power control configuration when the UE is configured with unified TCI states. |
| QC | Proposed answer for Q6: Yes, ul-powerControl-r17 should be always configured when UE is configured with unified TCI states. UE will not use R15/16 UL PC config when configured with unified TCI states |
| OPPO | Ok with the answer proposed by Samsung |
| vivo | Agree with Samsung’s proposed answer.If Rel-17 unified TCI state is configured, the higher layer parameter ul-powerControl-r17 is always configured. The field description for the parameter ul-powerControl-r17 is OK. When the UE is configured with unified TCI states, Rel-15/16 UL power control configuration is not required. |
| ZTE | ul-powerControl in a dedicated UL BWP provides a default power control parameter set per BWP.Fine with Samsung’s proposed answer.  |
| Huawei, HiSilicon | Fine with Samsung’s proposed answer. |
| Spreadtrum | Fine with Samsung’s proposed answer. |
| NTT DOCOMO | Fine with Samsung’s proposed answer. |
| Futurewei | Fine with Samsung’s proposed answer. |
| Intel | Agree with FL answer – the Rel-17 and legacy power control parameter configuration does not mix |
| Mod V19 | **Comment:** Based on the comments from the super-majority of companies, the following answer (based on Samsung’s input) is acceptable.**Moderator proposal for answer to question 6**: Yes, the UE is always configured with parameter ul-powerControl-r17 in BWP-UplinkDedicated or, optionally, in DLorJointTCIState/UL-TCIState. In this case, the UE will not use a Rel-15/16 UL PC configuration. |
| Mod V27 | No revision from V19 |

## Topic 6

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| **RRC#6** | **MPE reporting in ICBM (inter-cell beam management):** RAN2 has currently defined MPE resource pool as only using serving cell SSB/CSI-RS indexes. However, it was not clear if the MPE resource pool should also allow indicating SSB/CSI-RS indexes for the additional PCI so RAN2 would like to verify that. **Question 7:** In one MPE resource pool, can a MPE resource containing SSBRI/CRI be associated with an additional PCI? |

**Table 6**

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| **Company** | **Input** |
| Mod V00 | **Provide your inputs along with suggested answers to the questions** |
| Samsung | **Discussion**: The use of the enhanced MPE report for ICBM has been confirmed by an LS reply from RAN1. But its use for inter-cell mTRP scenarios was not considered in RAN1. **Proposed answer to question 7**: Yes  |
| Apple | Agree with Samsung’s proposed answer. |
| MediaTek | In Rel-17, only SSB can be associated with additional PCI. CSI-RS can QCL with SSB with additional PCI, but not directly associated with additional PCI.**Proposed answer to question 7**: Yes, but only when the MPE resource is an SSB resource. |
| Ericsson | In Rel-17, inter-cell beam management was introduced. The underlying idea was to remove the artificial restriction that all TRPs that are involved in beam management must broadcast the same PCI. From now on, the target must be that no beam management features should be constrained by the PCI broadcast by the TRPs. One of the additional features that were specified in Rel-17 is the enhanced PHR, where the UE can include (SSBRI,PH) pairs in the report. The SSBRI provides the NW with an alternative beam, from a configured set of candidate beams. Since we are trying to remove the artificial PCI restrictions, the configured candidate beams (reference signals) should not be limited to the reference signals of the serving cell. **Answer to Q7**: Yes. An explicit PCI, or AdditionalPCIIndex-r17, is needed for the MPE resource configuration |
| LG | We have a similar understanding with MediaTek that mpe-ResourcePool corresponds to a CSI-RS/SSB resource set and the SSB indices in the set is only associated with additional PCI |
| Lenovo | Agree with Samsung’s proposed answer. |
| QC | Proposed answer to Q7: Yes, a MPE resource can contain SSBRI/CRI associated with an additional PCI |
| OPPO | Ok with the answer proposed by Samsung |
| vivo | Agree with Samsung’s proposed answer. |
| ZTE | MPE source can be from a non-serving cell. Agree with Samsung’s proposed answer. |
| Huawei, Hisilicon | A MPE resource can contain SSBRI/CRI be associated with an additional PCI. But this should be subject to UE capability, that a dedicated UE capability should be introduced for this functionality. |
| Spreadtrum | Agree with Samsung’s proposed answer. |
| NTT DOCOMO | Agree with Samsung/Qualcomm’s proposed answer. |
| Intel | Agree with FL answer – we believe its beneficial to allow MPE resource from a TRP associated with additional PCI |
| Mod V19 | **Comment:** Based on the comments from companies, the answer from Samsung/Qualcomm/Ericsson seems acceptable. A note is added to accommodate Huawei’s comment **Moderator proposal for answer to question 7**: Yes. * Note: Depending on the outcome of UE capability discussion, this can be subject to UE capability
 |
| MediaTek | Since in Rel-17, only SSB can be associated with additional PCI, which has to be clarified to RAN2.Otherwise, the behavior will be unclear if CSI-RS is provided with additional PCI. Thus, we suggest the following change:**Moderator proposal for answer to question 7**: Yes, if the MPE resource contains an SSB index.* Note: Depending on the outcome of UE capability discussion, this can be subject to UE capability
 |
| MediaTek | Since RAN2 may decide whether to add additional PCI field for the MPE resource pool, it is better to clarify additional PCI is only needed for SSB, not for CSI-RS. As mentioned, CSI-RS can be associated with a cell with additional PCI, however, this doesn’t impact how RAN2 design the MPE resource pool. We think we can add one note to clarify that CSI-RS can be provided with a TCI state that includes an additional PCI, but CSI-RS cannot be directly associated with an additional PCI. Note that if CSI-RS can be associated with an additional PCI, we need to introduce some RRC configurations for the “non-serving cell” CSI-RS, which is not allowed at this stage.**Moderator proposal for answer to question 7**: Yes, at least an SSB resource in MPE resource pool can be directly associated with an additional PCI.* Note: Depending on the outcome of UE capability discussion, this can be subject to UE capability
* Note: A NZP-CSI-RS resource can be provided with a TCI state that includes an additional PCI.
 |
| Samsung | A reference signal can be associated with an additional PCI directly or indirectly. For the example, a NZP-CSI-RS can include a TCI state, and the TCI state is associated with an additional PCI.Therefore, it might be better to say:“A MPE resource can be associated directly/indirectly with a serving cell or a cell with a PCI different from the PCI of the serving cell.”In Summary:* Both the CSI-RS and SSB can be used for the MPE resource

MPE-Resource-r17 ::=                SEQUENCE {    mpe-ResourceId-r17                  INTEGER (1..maxMPE-Resources-r17),    cell                                ServCellIndex                                           OPTIONAL,    -- Need R    mpe-ReferenceSignal-r17             CHOICE {        csi-RS-Resource-r17                 NZP-CSI-RS-ResourceId,        ssb-Resource-r17                    SSB-Index    }}* For SSB: The SSB-index is from 0 to 7 (or 63 in FR2) and this doesn’t include the PCI, so we need to add the AdditionalPCI in MPE resource when configuring it to use the SSB-Index.

SSB-Index ::=                       INTEGER (0..maxNrofSSBs-1)* For CSI-RS: The CSI-RS is already associated with a TCI state and the UE can determine PCI based on this association

NZP-CSI-RS-Resource ::=             SEQUENCE {    nzp-CSI-RS-ResourceId               NZP-CSI-RS-ResourceId,    resourceMapping                     CSI-RS-ResourceMapping,    powerControlOffset                  INTEGER (-8..15),    powerControlOffsetSS                ENUMERATED{db-3, db0, db3, db6}                 OPTIONAL,   -- Need R    scramblingID                        ScramblingId,    periodicityAndOffset                CSI-ResourcePeriodicityAndOffset                OPTIONAL,   -- Cond PeriodicOrSemiPersistent    qcl-InfoPeriodicCSI-RS              TCI-StateId                                     OPTIONAL,   -- Cond Periodic    ...}The MPE-Resource could be defined as (extra part in yellow):MPE-Resource-r17 ::=                SEQUENCE {    mpe-ResourceId-r17                  INTEGER (1..maxMPE-Resources-r17),    cell                                ServCellIndex                                           OPTIONAL,    -- Need R    mpe-ReferenceSignal-r17             CHOICE {        csi-RS-Resource-r17                 NZP-CSI-RS-ResourceId,        ssb-Resource-r17                    SSB-Index    }    additionalPCI-r17               AdditionalPCIIndex-r17                                          OPTIONAL    -- Cond ssb-Resource}BTW, this is similar to the definition in UL TCI state or QCL info, there the additionalPCI should only be for SSB and not CSI-RSQCL-Info ::=                        SEQUENCE {    cell                                ServCellIndex                                               OPTIONAL,   -- Need R    bwp-Id                              BWP-Id                                                      OPTIONAL, -- Cond CSI-RS-Indicated    referenceSignal                     CHOICE {        csi-rs                              NZP-CSI-RS-ResourceId,        ssb                                 SSB-Index    },    qcl-Type                            ENUMERATED {typeA, typeB, typeC, typeD},    ...,    [[    additionalPCI-r17               AdditionalPCIIndex-r17                                          OPTIONAL    -- Need R    --Editor's note: Can be discussed if ASN1 overhead reasons should have another way to implement than using this extension.    --Editor's note: Needed in Rel-15/16 TCI state for mTRP intercell and in Rel-17 TCI state for BM intercell.    ]]}additionalPCI is only need for SSB. I think that this should be conditioned on SSB-Index indicated. |
| Mod V27 | **Comment:** The additional inputs from MediaTek and Samsung imply that: 1) both SSB and CSI-RS associated with additional PCIs for MPE reporting in case of ICBM, 2) no additional RRC spec support is needed for CSI-RS, only for SSB. To avoid any ambiguity and RAN1/2 ping-pong, some clarification on the details is needed.**Moderator proposal for answer to question 7**: Yes, with the following clarification (exact details are up to RAN2)* For SSB, an “additional PCI” can be added in *MPE-Resource-r17* (hence conditioned on choosing SSB for mpe-ReferenceSignal-r17).
* For NZP CSI-RS, since each NZP CSI-RS resource is associated with a TCI state (which already includes a PCI), no “additional PCI” needs to be added in *MPE-Resource-r17*
* Note: Depending on the outcome of UE capability discussion, this can be subject to UE capability
 |

## Topic 7

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| **RRC#7**  | **Max values FFS in Rel-17 TS 38.331**Some maximum values are still missing from RRC configuration and RAN2 needs those for ASN.1 freezing.**Question 8:** Please provide value for maxNrofCandidateBeams-r17 and maxNrofBFDResourcePerSet-r17. |

**Table 7**

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| **Company** | **Input** |
| Mod V00 | **Provide your inputs along with suggested answers to the questions** |
| Samsung | **Discussion**: The latest LS reply has indicated that maxNrofCandidateBeams-r17 is 64. From the latest outcome of UE feature discussion, maxNrofBFDResourcePerSet-r17 is indeed set to 2. However, this number may need to be changed to 64 if a new MAC-CE is introduced for issue MAC#4.**Proposed answer to question 8*** maxNrofCandidateBeams-r17 is 64 per set per CC according to the latest LS reply
* maxNrofBFDResourcePerSet-r17 depends on the outcome of issue MAC#4
	+ If RAN2 decides not to introduce a new MAC-CE for BFD-RS activation, the value of 2 per the outcome of UE feature discussion stands.
	+ If RAN2 decides to introduce a new MAC-CE for BFD-RS activation, the value of 64 is more sensible since the new MAC-CE is used to activate 1 or 2 BFD-RS resources from the set.
 |
| Apple | According to the LS provided by RAN1 in last meeting, the answer should be 64 for both. |
| MediaTek | Okay to the proposed answer from Samsung |
| LG | Regarding maxNrofBFDResourcePerSet-r17, 64 is too large which would result in 128 BFD-RSs across two sets. We think that around 8 would be sufficient. |
| Lenovo | Agree with Samsung’s proposed answer. |
| QC | Proposed answer to Q8: 64 is for maxNrofCandidateBeams-r17. If gNB enables MAC-CE based BFD-RS update, maxNrofBFDResourcePerSet-r17 is 64. Otherwise, maxNrofBFDResourcePerSet-r17 is 2. |
| OPPO | Ok with the answer proposed by Samsung |
| vivo | For the value for maxNrofCandidateBeams-r17, it should be 64. For the value of maxNrofBFDResourcePerSet-r17, it is still being discussed in RAN1 and no clear definition has been drawn so far. Therefore, we prefer to reply that it is still being discussed in RAN1 if no conclusion reached in RAN1 before reply LS is sent. |
| ZTE | Agree with Apple, based on the previous LS, the answer should be 64 for both. BTW, MAC-CE has been approved, why we need to discuss the other direction of ‘not introducing a new MAC-CE’ as in Samsung’s proposal. The motivation is confusing.  |
| Huawei, HiSilicon | Agree with Samsung’s proposed answer. |
| Spreadtrum | Agree with Samsung’s proposed answer. |
| NTT DOCOMO | The value of maxNrofCandidateBeams-r17 is 64.For the value of maxNrofBFDResourcePerSet-r17, we do not agree with Samsung’s answer on MAC-CE part, and we have similar concern as ZTE. We also agree with vivo that it has not been discussed before. But we’re okay with maxNrofBFDResourcePerSet-r17 to be 64. |
| Samsung  | @ZTE and NTT Docomo (comment on Samsung’s input):* The reason we mentioned whether a new MAC CE will be introduced or not in RAN2 (despite RAN1 agreement) is because at least one company in RAN2 argues against it. The reason was that FeMIMO has been declared 100% complete in 03/2022 RAN and introducing a new MAC CE for BFD-RS set would require a CatB CR. The company argues that RRC is sufficient and adding MAC CE is an optimization and shouldn’t be done in RAN2 at this stage (hence RAN1 agreement wouldn’t be implemented in RAN2). This is despite the fact that this issue was listed as a remaining maintenance issue in the SR (referred to here as MAC#4).
* To be clear, it is not Samsung’s position that RAN2 shouldn’t introduce a new MAC CE for BFD-RS set. It is our preference to implement RAN1 agreement in RAN2 as it is.
* Given the above situation, since the answer to **question 8** depends on the above RAN2 outcome, we provided a complete answer to anticipate either outcome to avoid ping-pong between RAN1 and RAN2 (thereby derailing ASN.1 review completion in 06/2022). Hence, it is our position that we must provide such complete answer to RAN2.
 |
| ZTE | Thank you so much for your great efforts and nice clarification. Generally, we only need to reply to RAN2 based on their question, and it seems that in this LS, they did not challenge that. Frankly speaking, this recommended reply may weaken our RAN1 position (already agreed in RAN1), make this feature a little bit controversial and introduce unnecessary discussion in RAN2. Then, it should be noticed that, as mentioned by some other companies, in R1-2202720 (i.e., approved reply LS to RAN2 last meeting), we have already answered the question as follows:

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| **Question 2.4:** Please inform how to implement beam failure detection RS sets for mTRP. Also what is the maximum number of detection resources to be configured per UE per cell or per TRP? What is the maximum number of recovery resources to be configured per UE per cell or per TRP?**Answer 2.4:** RAN1 agreed to support both explicit and implicit beam failure detection (BFD) RS sets configurations for mTRP, and the implicit BFD RS sets can only be configured for mDCI based mTRP (i.e., when PDCCH-Config contains two different values of coresetPoolIndex). The two beam failure detection RS sets are to be configured per DL BWP (BWP-DonwlinkDedicated). For implicit configuration, the UE determines the two BFD RS sets including periodic CSI-RS resource configuration indexes having the same values as the source RS indexes in the TCI states for the CORESETs associated with respective pool indexes 0 and 1. Details on explicit configuration (RRC, MAC-CE or RRC+MAC-CE) are still under discussion in RAN1. RAN1 will notify RAN2 after RAN1 reach any consensus.The maximum number of detection resources per set per CC is 64, which is subject to UE capability. |

So, we may echo/refer to the above reply. Alternatively, we do not provide any further reply to ‘maxNrofBFDResourcePerSet-r17’ and just let RAN2 further review this existing reply LS.  |
| NTT DOCOMO | Thanks Samsung for kind clarification.We still share the similar view as ZTE. First, RAN2 did not ask us the challenge on MAC CE. Second, RAN1 should follow RAN1’s agreement.Hence, if we’d like to provide a complete answer, it could be:* The value of maxNrofBFDResourcePerSet-r17 is 64. MAC-CE is used to activate 1 or 2 BFD-RS resources for each set.
 |
| Futurewei | Agree with Samsung’s proposed answer. |
| Intel | FL answer is okay |
| Mod V19 | **Comment:** Based on the comments from companies, the following answer should be acceptable assuming that RAN2 implements RAN1 agreement. **Moderator proposal for answer to question 8**: * maxNrofCandidateBeams-r17 is 64 per set per CC according to the latest LS reply
* maxNrofBFDResourcePerSet-r17 is 64
	+ RAN1 has agreed to introduce MAC-CE for BFD-RS activation (in addition to RRC configuration). The intended operation is for MAC-CE to activate 1 or 2 out of the (maximum of) 64 configured BFD-RS resources from the set
 |
| QC | To our understanding, MAC-CE based BFD RS activation is the last minute agreement and should be optional. We need more time to justify the benefit versus complexity. Therefore, we prefer to have RRC configured BFD RS as baseline as in R15/16 and leave the MAC-CE based BFD RS activation as optional and decide the max BFD RS # accordingly. **Proposed answer to question 8**: * maxNrofCandidateBeams-r17 is 64 per set per CC according to the latest LS reply
* If UE supports MAC-CE based BFD RS activation, maxNrofBFDResourcePerSet-r17 is 64
	+ RAN1 has agreed to introduce MAC-CE for BFD-RS activation (in addition to RRC configuration). The intended operation is for MAC-CE to activate 1 or 2 out of the (maximum of) 64 configured BFD-RS resources from the set
* Otherwise, maxNrofBFDResourcePerSet-r17 is 2
 |
| CATT | Support moderator proposal for answer to question 8.We share similar view as ZTE and DOCOMO, MAC-CE was approved in RAN1#108-e and has already been captured in RAN1 specification. There is no need to discuss whether to introduce a MAC-CE for BFD-RS activation.The value of maxNrofBFDResourcePerSet-r17 is 64. If more than 2 BFD-RSs are configured for each BFD-RS set, up to2 BFD-RS can be activated (i.e., not exceed UE capability).The value of maxNrofCandidateBeams-r17 can also be 64. |
| LG | We agree with QC that MAC-CE based BFD RS activation is for further optimization compared to legacy RRC based scheme as we intensively discussed in last meetings. We support the modified answer from QC. |
| Apple | Agree with QC’s proposed answer |
| Mod V27 | **Comment:** As pointed out by Qualcomm, LG, and Apple, the support of such BFD-RS MAC-CE is (should be) UE optional. So the latest answer can be revised as follows. **Moderator proposal for answer to question 8**: * maxNrofCandidateBeams-r17 is 64 per set per CC according to the latest LS reply
* Regarding maxNrofBFDResourcePerSet-r17, RAN1 has agreed to introduce MAC-CE for BFD-RS activation (in addition to RRC configuration):
	+ If UE supports MAC-CE based BFD RS activation, maxNrofBFDResourcePerSet-r17 is 64
		- The intended operation is for MAC-CE to activate 1 or 2 out of the (maximum of) 64 configured BFD-RS resources from the set
	+ Otherwise, maxNrofBFDResourcePerSet-r17 is 2
 |

## Topic 8

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| **RRC#8** | **Possibilities for BFD-RS configuration**The existing RRC signalling for BFD-RS configuration allows the following possibilities:* Alt.1: Two explicit BFD-RS sets: e.g. failureDetectionSet1-r17 and failureDetectionSet2-r17 with respective bfdRSSetId-r17
* Alt.2: Only one explicit BFD-RS set: e.g. failureDetectionSet1-r17 or failureDetectionSet2-r17 with bfdRSSetId-r17. It requires that the UE determines BFD-RS for the other BFD-RS set, e.g. according to TCI state(s) for PDCCH reception and the corresponding coreset pool index.
* Alt.3: BFD-RS without explicit BFD-RS set: e.g. failureDetectionSet1-r17 or failureDetectionSet2-r17 without bfdRSSetId-r17. It requires that the UE determines the BFD-RS set which each BFD-RS belongs to.

RAN2 thinks that at least Alt.1 is possible, but would like to understand whether RAN1 specifications support Alt.2 or Alt.3.**Question 9:** Please confirm whether Alt.2 and Alt.3 are allowed configurations according to the existing RAN1 specifications, or whether RRC signalling for BFD-RS configuration should exclude Alt.2 and Alt.3. |

**Table 8**

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| **Company** | **Input** |
| Mod V00 | **Provide your inputs along with suggested answers to the questions** |
| Samsung | **Discussion**: For the explicit BFD-RS configuration, according to the RAN1 specification (TS 38.213 clause 6), both BFD-RS sets $\overbar{q}\_{0,0}$ and $\overbar{q}\_{0,1}$ of respective periodic CSI-RS resources are provided to the UE (i.e., Alt.1). The corresponding texts in the TS 38.213 for the explicit BFD-RS configuration are quoted and highlighted below:“Instead of the sets $\overbar{q}\_{0}$ and $\overbar{q}\_{1}$, for each BWP of a serving cell, the UE can be provided respective two sets $\overbar{q}\_{0,0}$ and $\overbar{q}\_{0,1}$ of periodic CSI-RS resource configuration indexes that can be activated by a MAC CE [11 TS 38.321] and corresponding two sets $\overbar{q}\_{1,0}$ and $\overbar{q}\_{1,1}$ of periodic CSI-RS resource configuration indexes and/or SS/PBCH block indexes by *candidateBeamRSList1* and *candidateBeamRSList2*, respectively, for radio link quality measurements on the BWP of the serving cell.”The mixed explicit BFD-RS configuration and implicit BFD-RS determination in Alt.2 was not discussed in RAN1. According to the current RAN1 specification, if either of the BFD-RS sets $\overbar{q}\_{1,0}$ and $\overbar{q}\_{1,1}$ is not explicitly provided/configured, the UE implicitly determines the corresponding BFD-RSs according to TCI state(s) for PDCCH reception. The corresponding texts in the TS 38.213 for the implicit BFD-RS determination are quoted and highlighted below (note that the highlighted condition does not imply “only one explicit BFD-RS set” in Alt.2):“If the UE is not provided $\overbar{q}\_{0,0}$ or $ \overbar{q}\_{0,1}$ for a BWP of the serving cell, the UE determines the set $\overbar{q}\_{0,0}$ or $ \overbar{q}\_{0,1}$ to include periodic CSI-RS resource configuration indexes with same values as the RS indexes in the RS sets indicated by *TCI-State* for first and second CORESETs that the UE uses for monitoring PDCCH, where the UE is provided two *coresetPoolIndex* values 0 and 1 for the first and second CORESETs, or is not provided *coresetPoolIndex* value for the first CORESETs and is provided *coresetPoolIndex* value of 1 for the second CORESETs, respectively.” The descriptions in Alt.3 are a bit unclear. They seem to suggest that the UE is first provided a number of BFD-RSs, and then the UE would autonomously assign the provided BFD-RSs to two sets. Such operation/behavior was not discussed in RAN1 and not in the RAN1 specification. The RAN1 specification states that the UE is provided respective two sets explicitly. **Proposed answer to question 9**: the explicit BFD-RS configuration and the corresponding signalling should follow Alt.1 only (Alt.2 and Alt.3 are excluded according to the current RAN1 specification). |
| Apple | Alt2/Alt3 is not supported for sDCI mode. RAN1 has concluded that implicit BFD RS configuration is not supported for sDCI mode. For Alt2, UE should only perform BFD for the TRP with BFD RS set configured. |
| MediaTek | Only Alt1 is allowed, and Alt2 and Alt3 should be excluded. |
| Ericsson | **Answer to Q9:**Alt 1 and Alt 3 are valid configurations and correspond to explicit and implicit BFD-RS set configurations, respectively. Alt 2 is not a valid configuration and should be excluded. |
| LG | Similar view with Samsung. Support Alt 1 only. |
| Lenovo | Support Alt 1 only.  |
| QC | Proposed answer to Q9: Alt2 is excluded. UE is not expected to do implicit BFD for one set, while explicit BFD for the other set. Alt3 is included for implicit BFD for both sets.  |
| OPPO | In our understanding, RAN1 didn’t discuss the mixed mode (explicit for one BFD RS set and implicit for the other BFD RS set) of BFD RS set determination during Rel-17. From our reading on the 2nd highlighted text captured by Samsung from TS 38.213, we tend to believe that when BFD RS sets are not provided, both BFD RS sets would be not provided to UE. In addition, we didn’t see any reason to partially configure the BFD RS sets and leave other parts for UE to determine by itself. We think RRC configuration of Alt.1 would work well and RRC configuration for BFD RS should exclude Alt.2 and Alt.3. |
| vivo | Share similar views with MediaTek. |
| ZTE | Alt1 and following Alt 4 (implicit manner) should be allowed. We are OK for Alt 2 if most companies support it. Alt3 should be excluded.  Alt4: No explicit BFD-RS set, e.g. Neither failureDetectionSet1-r17 nor failureDetectionSet2-r17 with bfdRSSetId-r17 is configured. It requires that the UE determines BFD-RS for each of two BFD-RS set, e.g. according to TCI state(s) for PDCCH reception and the corresponding coreset pool index.@Ericsson, from our perspective, Alt3 should be precluded. In such case, BFD-RS is configured without set index in Alt3. It is difficult for the UE to determine the set index of a BFD-RS and it leads unnecessary overhead of MAC-CE for updating the BFD-RS set.  |
| Huawei, Hisilicon | Support Alt-1.For Alt-3, as mentioned by Samsung, the description is not clear enough. Does it mean UE determining each BFD-RS set according to TCI-state of PDCCH corresponding to each CORESETPoolIndex value? If so, we support it. |
| Spreadtrum | We don’t see the need to support mixed BFD-RS set configuration, the two BFD-RS sets should be explicitly configured together or implicitly determined together. Only Alt-1 is preferred. |
| NTT DOCOMO | Similar view with MTK/vivo.Also agree with ZTE to provide information of Alt4 (correct implicit manner). |
| Futurewei | Support Alt-1. Alt-2 should be excluded. Alt-3 needs clarification. |
| Intel | FL answer is fine, we think only Alt-1 is okay |
| Mod V19 | **Comment:** Based on the comments from the super-majority of companies, only Alt1 is valid per RAN1 specs. Some companies suggest that the current formulation of Alt3 is unclear (e.g. Samsung, Huawei, Futurewei). Re Alt4 brought up by ZTE, since RAN2 didn’t bring this up, it seems better not to add this to avoid further confusion ☺ **Moderator proposal for answer to question 9**: Based on RAN1 agreements and Rel-17 RAN1 specification, * Only Alt1 is allowed.
* Alt2 is excluded.
* [The current description of Alt3 suggests that it is excluded as well]
 |
| QC | For Alt3, this part and this part seem conflict with each other. Suggest RAN2 to clarify. If this part is what they mean, we think this is the implicit BFD RS and should be supported. If this part is what they mean, we think it should not be supported. To update our view: Alt1 is allowed, Alt2 is not allowed, Alt3 depends on RAN2 clarification* Alt.3: BFD-RS without explicit BFD-RS set: e.g. failureDetectionSet1-r17 or failureDetectionSet2-r17 without bfdRSSetId-r17. It requires that the UE determines the BFD-RS set which each BFD-RS belongs to.
 |
| Helka-Liina (RAN2 contact person for the LS) | UE needs to determine that field called failureDetectionSet1 is set nro 1 and field called failureDetectionSet2 is set nro 2. In both Alt1 and Alt3 UE will receive:    [[    failureDetectionSet1-r17                BeamFailureDetectionSet-r17                                           OPTIONAL, -- Need R    failureDetectionSet2-r17                BeamFailureDetectionSet-r17                                           OPTIONAL,  -- Need Rwhere: BeamFailureDetectionSet-r17  ::=    SEQUENCE {    bfdRSSetId-r17                    INTEGER (1..2)                                                            OPTIONAL, -- Need R    bfdResourcesToAddModList-r17        SEQUENCE (SIZE(1..maxNrofBFDResourcePerSet-r17)) OF RadioLinkMonitoringRS                                                                                                                  OPTIONAL, -- Need N    bfdResourcesToReleaseList-r17       SEQUENCE (SIZE(1..maxNrofBFDResourcePerSet-r17)) OF RadioLinkMonitoringRS-Id                                                                                                                  OPTIONAL, -- Need N    beamFailureInstanceMaxCount-r17     ENUMERATED {n1, n2, n3, n4, n5, n6, n8, n10}                              OPTIONAL, -- Need R    beamFailureDetectionTimer-r17       ENUMERATED {pbfd1, pbfd2, pbfd3, pbfd4, pbfd5, pbfd6, pbfd8, pbfd10}      OPTIONAL, -- Need R    ...--editor's note: maxNrofBFDResourcePerSet-r17 is said in LS 64 but feature discussion might indicate just max 2 per set}is either with or without the yellow marked INTEGER. |
| ZTE | Regarding Q9, in our views, the controversial part is that the intention of current RAN2 description on Alt-3 is just to clarify signaling design or to imply another option, i.e., the implicit manner of BFD -RS determination. For the latter one, we provide an exact description for implicit manner, i.e., Alt4, in our mind. If the question is just for the former, as Helka mentioned, we think that it is much relevant to RAN2 RRC signaling feature. As usual, we may just clarify the functionality from RAN1 perspective, and how/whether to remove the yellow highlighted part may be up to RAN2. '' Two explicit BFD -RS sets: e.g. failureDetectionSet1-r17 and failureDetectionSet2-r17. Whether each set should be configured with respective bfdRSSetId-r17, is up to RAN2'' |
| Apple | Since RAN2’s question is confusing, we suggest we ask them to clarify Alt3 and the usage of bfdRSSetId-r17. If this RRC parameter is useless, RAN2 can delete it. |
| Mod V27 | **Comment:** After further discussion and input from RAN2 (represented by the contact person Helka-Liina), the only difference between Alt1 and Alt3 is that Alt1 includes an explicit *bfdRSSetId* parameter in *BeamFailureDetectionSet-r17* IE whereas Alt3 doesn’t. It doesn’t seem to represent the so-called implicit method. Per inputs from, e.g. ZTE and Qualcomm, Alt3 should then be excluded. **Moderator proposal for answer to question 9**: Based on RAN1 agreements and Rel-17 RAN1 specification, * Alt1 is allowed.
* Alt2 is excluded.
* The current formulation of Alt3 in the LS is unclear. If the only difference between Alt1 and Alt3 is that Alt1 includes an explicit *bfdRSSetId* parameter in *BeamFailureDetectionSet-r17* IE whereas Alt3 doesn’t, Alt3 is excluded.
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# References

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| --- | --- | --- | --- |
| 1 | R2-2204361 | LS on further questions on feMIMO RRC parameters | RAN2 |
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