3GPP TSG-RAN WG2 #117-e R2-22xxxxx

Electronic Meeting, Feb 21- March 3, 2022

Agenda Item: 8.17.4.1

Source: Intel Corporation

Title: Summary of 8.17.4.1 RRC and General (Intel)

Document for: Discussion, Decision

# Introduction

We would like to discuss some remaining issue on RRC parameters.

There will be two separate threads for open issues regarding RRC parameters.

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| 8.17.1.3 CRs and Rapporteur Resolutions Tdoc Limitation: 0.  CR Rapporteurs to provide running CRs, potentially updated, provide resolution proposals to Rapporteur Handled Open Issues, See also R2-2202001  RRC:  - whether pathloss reference and power control parameters of PUSCH/PUCCH/SRS should be associated with Joint TCI state  - How to refer to a BWP/CC, where Joint/DL and UL TCI state pool are defined  - On SRS partial sounding, there is a parameter ‘StartRBIndex’ that is missing in ASN1. In 38.211, there is: ”k\_F∈{0,1,…,P\_F-1} is given by the higher-layer parameter StartRBIndex if configured, otherwise k\_F=0”.  - Many maxNRof values are not added in the CR(e.g. rows 24,25). Suggestion: rapporteur provides in next version towards 117  - Row 18 “PDSCH configuration for each CC/BWP. The reference CC/BWP includes the Rel-17 TCI state pool (a list of TCI states) for PDSCH” not implemented. Suggestion: rapp provides in next version towards 117  - Rows 16,17 DLorJOint-TCIState-Id-r17 not implemented in CSI-AssociatedReportConfigInfo or NZP-CSI-RS-Resource. Suggestion: rapp provides in next version towards 117 |

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| This pre RAN2#117 discussion covers the following items:  - pucch-PowerControlSet to be aligned with the corresponding MAC CE design, R2 action: develop common understanding on the operation.  - BFD/BFR RRC configuration is not implemented. Rows 60-62, 67. R2 action: develop common understanding on the operation.  - the detail SSB configuration of aTRP, and including whether such IE is also applicable for mTRP (4.1), why put it under SSB-MTC (4.2), wheher there is a disconnect on the application of PUCCH-SpatialRelationInfo (4.4.),  - How to indicate serving cells, which will share common TCI state i.e. share the MAC CE and DCI from one reference serving cell (this issue is also related to the configuration of beamAppTime-r17). |

In this summary, we discuss remaining issues that are not overlapped with the above.

# Beam management

# TCI state type indication

Currently, RRC running CR [1], includes tci-StateType-r17 in each TCI state to indicate the TCI state type.

DLorJoint-TCIState-r17 ::= SEQUENCE {

tci-StateUnifiedId-r17 DLorJoint-TCIState-Id-r17,

tci-StateType-r17 ENUMERATED {DLOnly, JointULDL},

qcl-Type1-r17 QCL-Info,

qcl-Type2-r17 QCL-Info OPTIONAL -- Need R

}

Related to this, the following proposals are proposed.

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| Tdocs | Proposals |
| R2-2203102 [9] | Proposal 1: RAN2 to agree that a new IE indicating the mode of the R17 unified TCI framework is introduced within the ServingCellConfig. |
| R2-2203381 [13] | Proposal 1: One RRC parameter should be introduced to indicate which TCI mode (joint or separate) should currently be used in a serving cell. We assume this parameter can be put in *ServingCellConfig* IE.  Proposal 2: The *tci-StateType-r17* parameter should be removed from the current RRC running CR. |

First thing to discuss is to understand what TCI state modes are supported because RAN1 agreement is not so clear. The related RAN1 agreement is copied below for reference.

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| **RAN1 #105-e**  **[Conclusion]** On Rel-17 unified TCI framework, for a UE configured with both joint TCI and separate DL/UL TCI, configuration of joint TCI or separate DL/UL TCI is based on RRC signaling  There is no consensus in RAN1 on how to support dynamic switching (either MAC-CE or codepoint based) |

The followings are potential TCI modes that gNB may configure in the TCI list.

1. Both joint TCI and separate DL/UL TCI
2. Joint TCI
3. Separate TCI

But it is not clear whether the first mode is supported. The current RRC running CR would be introduced to support the first mode i.e. each TCI state can be different between DL only and DL/UL TCI state. If we support only mode 2 and mode 3, the proposals from the above [9] & [13] would be reasonable.

**Proposal 1: RAN2 discuss whether “both joint TCI and separate DL/UL TCI state” is not supported.**

**Proposal 2: if proposal 1 is agreed, RAN2 agree the following changes.**

* Proposal 1: indicate which TCI mode (joint or separate) should currently be used in a serving cellin the ServingCellConfig
* Proposal 2: The *tci-StateType-r17* parameter should be removed from the current RRC running CR.

**Proposal 3: if proposal 1 is not agreed, RAN2 confirms that “both joint TCI and separate DL/UL TCI state” is supported but no change is required.**

If RAN2 may not be able to conclude, RAN2 needs to send an LS to RAN1 to ask.

# Support of new BFR mechanism for BM

R2-2203103 [10] propose the following.

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| Tdocs | Proposals |
| R2-2203103 [10] | Proposal 1: RAN2 to confirm the beams associated with aTRP can be configured in candidateBeamRSList/candidateBeamRSSCellList as the candidate beams for BFR.  Proposal 2: Network implementation ensures that the aTRP(s) are not reconfigured while it is being used by the UE for Tx/Rx. No specification impact is required to avoid the potential error case (if any). |

First thing to discuss is whether new BFR will be applied to BM. As indicated in [10], RAN1 agreement is unclear whether new BFR mechanism is supported for BM. From moderator pov, if there is any concern, it would be practical to ask RAN1 on the exact status.

**Proposal 4: RAN2 discuss whether new BFR mechanism can be supported for BM.**

**Proposal 5: if proposal 4 is agree, RAN2 discuss the following changes are needed ?**

* Proposal 1: RAN2 to confirm the beams associated with aTRP can be configured in candidateBeamRSList/candidateBeamRSSCellList as the candidate beams for BFR.
* Proposal 2: Network implementation ensures that the aTRP(s) are not reconfigured while it is being used by the UE for Tx/Rx. No specification impact is required to avoid the potential error case (if any).

# simultaneousTCI-UpdateList1-r17 and simultaneousTCI-UpdateList2-r17

R2-2202447 [4] discussed about common TCI state update.

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| Tdocs | Proposals |
| R2-2202447 [4] | Proposal 3: Two additional serving cell list i.e. simultaneousTCI-UpdateList1-r17 and simultaneousTCI-UpdateList2-r17 should be introduced for common TCI state update (sharing) |

It is understanding that this proposal is referring to Rel-16 common TCI state update i.e. TCI of multiple serving cells can be activated with the same MAC CE. Although we asked about common TCI state update in RAN2 #116bis-e meeting, it didn’t include whether/how Rel-16 type of common TCI state update should be supported with unified TCI framework.

First thing is to check our understanding on this feature. It appears that RAN1 supports the following types of

* Type 1: Common TCI state list configuration with reference BWP/CC
* Type 2 (Rel-16): common MAC CE activation across multiple cells.

**Proposal 6: RAN2 confirms that Type 2 (Rel-16) common TCI state update (i.e. common MAC CE activation across multiple cells) is supported for unified TCI state framework.**

**Proposal 7: if proposal 6 is agreed, Two additional serving cell list i.e. simultaneousTCI-UpdateList1-r17 and simultaneousTCI-UpdateList2-r17 should be introduced for common TCI state update.**

# Relationship between unified TCI framework and mTRP

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| Tdocs | Proposals |
| R2-2203102 [9] | Proposal 6: NW to ensure that CORESETPoolindex within a BWP should be the same value when configured with R17 unified TCI framework.  Proposal 7: The newly introduced MAC CE for R17 unified TCI framework is not applicable to any of the configured CORESETs in a BWP if the CORESETs are configured with different CORESETPoolindex values in the BWP. |

The proponent observe that the R17 unified TCI framework does not apply to R16 intra-cell mTRP scenario.

**Proposal 8: RAN2 confirms that the newly introduced MAC CE for R17 unified TCI framework is not applicable to any of the configured CORESETs in a BWP if the CORESETs are configured with different CORESETPoolindex values in the BWP.**

# Issues related to the current running CR

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| Tdocs | Proposals |
| R2-2202319 [2] | Proposal 1: The approach to link unified TCI state information to SSB/PCI information is to include an index of aTRP with corresponding configurations to associate with TCI state. |

In the current running CR, additionalPCI-r17 is introduced in Addition QCL-Info, which can link unfied TCI state to DLorJoint-TCIState-r17. And additionalPCI-r17 is also introduce in UL-TCIState-r17. It is not clear whether the additional information is needed.

**Proposal 9: RAN2 discuss whether the current running CR is enough to include SSB/PCI information.**

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| Tdocs | Proposals |
| R2-2202669 | Proposal 4: for searchSpaceLinking, in each SearchSpace, the linked SS index (SearchSpaceId) is added. |

In the current CR, searchSpaceLinking is included in each DCI format. However, there is no need to introduce searchSpaceLinking in each DCI format.

**Proposal 10: RAN2 discuss whether for searchSpaceLinking, in each SearchSpace, the linked SS index (SearchSpaceId) is added.**

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| Tdocs | Proposals |
| R2-2203041 | 1. RAN2 discuss whether existing TCI state ID space should be reused for unified TCI state for joint/DL TCI state. |

In the current CR, DLorJoint-TCIState-Id-r17 is introduced but it is also possible to TCI-StateId for the DLorJoint-TCIState-r17 IE.

**Proposal 11: RAN2 discuss whether existing TCI state ID space should be reused for unified TCI state for joint/DL TCI state.**

# Proposals that can be postponed for RAN1 response

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| Tdocs | Proposals |
| R2-2202319 [2] | Proposal 2: The parameter BeamAppTime could be configured under the cell group config.  Proposal 3: For all CCs in the CC list, RAN2 to confirm RAN1 conclusion BAT associated with the carrier(s) on which the beam indication applies is determined based on the carrier with the smallest SCS among the carrier(s) applying the beam indication. |

RAN2 asked RAN1 about details of BeamAppTime. Therefore, we can wait for RAN1 input.

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| Tdocs | Proposals |
| R2-2202669 | Proposal 1: RAN2 confirms that ApplyTCI-State-r17-DLList should include enabling/disabling of TCI state sharing for AP-CSI-RS for BM, AP-CSI-RS for CSI, DL DMRS for non-UE-dedicated PDCCH/PDSCH separately.  Proposal 2: RAN2 agree to introduce ApplyTCI-State-r17-DLList in PDSCH-Config. |

# FFS for RAN2 agreement on SI reception

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| Tdocs | Proposals |
| R2-2202348 | Proposal 1: RAN2 agreement is revised:  The network can update SIBn information for the UE in RRC\_CONNECTED either via dedicated configuration, or via switching UE to pTRP for SI reception.  Proposal 2: In addition to SI update, the NW needs to provide the SIB for UE in RRC\_CONNECTED after 3 hours since last SIB transmission.  Proposal 3: When needed, it is up to NW to provide the SIB either via dedicated configuration, or via switching UE to pTRP for SI reception.  Proposal 4: RAN2 is asked to discuss whether stage-2, stage-3 or both specification modifications are needed to apply these mechanisms. |

The proponent wants to clarify some points and resolve FFS on the previous RAN2 agreement copied below.

* Allow NW to update UE SI information either via dedicated configuration, or via switching UE to pTRP for SI reception. FFS if these require specification modifications and whether there are critical issues with the mechanisms.

Although RAN2 could discuss each proposal to have clear understanding on the agreement, considering the limited time and that the agreed SI reception is the same existing mechanism, it might be more efficient to discuss the detailed clarifications based on either stage-2 CR or stage-3 CR. Therefore, the immediate point to discuss is about whether it should be captured in TS38.300 or TS38.331. And then, the CR rapporteur could handle the further clarification.

**Proposal 12: RAN2 discuss whether SI reception in inter-cell BM should be described in TS38.300 or TS 38.331.**

# mTRP

# RRM impact with mTRP

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| Tdocs | Proposals |
| R2-2203126 [11] | Proposal 1: When multiple PCIs are associated to the same serving cell, RAN2 is kindly requested to clarify which PCI is used for the measurement event evaluation (e.g. A3/A5).  Proposal 2: When multiple PCIs are associated to the same serving cell, RAN2 is kindly requested to clarify which PCI measurement result is included in the serving cell measurement report (i.e. *measResultServingCell*). |

The moderator’s understanding is that RAN1 indicated that there is no impact to RRM in RAN1 LS [14].

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| c) **SSB reception:** is the UE able to always receive CD-SSB from *serving cell TRP* when needed and is there any impact to RRM measurements of serving or neighbour cells?  **Answer 2.c**: The UE is always able to receive CD-SSB from serving cell TRP. There is no impact on RRM measurements of serving or neighbour cells. |

**Proposal 13: RAN2 confirms that there is no impact to RRM with inter-cell mTRP.**

# Issues related to the current running CR

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| Tdocs | Proposals |
| R2-2202447 [4] | Proposal 2: configure csi-SSB-ResourceSet-r17 within resourcesForChannel2-r17 as CSI-SSB-ResourceSetId |

Since csi-SSB-ResourceSet-r17 cannot be indicated other than 1, it should be updated.

csi-SSB-ResourceSet-r17 INTEGER (1..maxNrofCSI-SSB-ResourceSetsPerConfig

It seems valid point because csi-SSB-ResourceSet-r17 is configured with “1” only which is the same as Rel-15 csi-SSB-ResourceSet.

**Proposal 14: RAN2 discuss whether to configure csi-SSB-ResourceSet-r17 within resourcesForChannel2-r17 as CSI-SSB-ResourceSetId (i.e. instead of INTEGER (1..maxNrofCSI-SSB-ResourceSetsPerConfig).**

# HST-SFN

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| Tdocs | Proposals |
| R2-2202447 [4] | Proposal1: sfnSchemePdsch in PDSCH-Config is only applicable for BWP-DownlinkDedicated |
| R2-2203043 [8] | Proposal 1 If RAN1 does not provide the clarification RAN2 agrees that sfnSchemePdsch in PDSCH-Config is not applicable for BWP-DownlinkCommon |

The main issue comes from the following RAN1 agreement.

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| **Agreement**  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 |

It is not clear that why RAN1 left it as FFS. The moderator’s understanding is that RAN1 simply left to FFS because it is not actual BWP (not like initial BWP) and then it is not sure whether RAN1 could just apply the “exception”. That is, there is no technical debate or consideration to discuss further. Therefore, it seems possible for RAN2 to agree.

**Proposal 15: RAN2 agree that sfnSchemePdsch in PDSCH-Config is only applicable for BWP-DownlinkDedicated.**

# Proposals that are overlapped with Rapporteur Handled open issue list and pre-meeting open issue list.

It appears that the following proposals are overlapped with the existing open issue list. Therefore, we can discuss in existing open issue list.

* R2-2202927 PUCCH power control for mTRP FR1 Samsung discussion Rel-17 NR\_feMIMO-Core
  + All proposals
* R2-2203102 Discussions on the remaining RRC issues of feMIMO CATT discussion Rel-17 NR\_feMIMO-Core
  + Proposal 3: The PCI index associated with the TCI state shall be used to identify the TRP that the TCI state applies, i.e., the two QCL-Type if included within the TCI-state should share a single PCI index.
  + Proposal 4: RAN2 to agree the above TP on implementing the association of the PCI index and the TCI state.
  + Proposal 5: RAN2 to agree the above TP on implementing the association of the additional PCI and SSB.
* R2-2203263 Signaling support for UL power control for BM LG Electronics France discussion Rel-17
* R2-2203381 FeMIMO RRC issues Huawei, HiSilicon discussion Rel-17 NR\_feMIMO-Core
  + Proposal 3: Define a RRC list containing power control parameter set (p0, alpha, and closed loop index) for PUCCH, PUSCH and SRS. Each joint TCI state and UL-only TCI state may associate with one element of this list.

# Conclusion

**Easy agreement**

HST-SFN

**Proposal 15: RAN2 agree that sfnSchemePdsch in PDSCH-Config is only applicable for BWP-DownlinkDedicated.**

mTRP: RRM impact with mTRP

**Proposal 13: RAN2 confirms that there is no impact to RRM with inter-cell mTRP.**

**Proposals for further discussion**

Issue 1: TCI state type indication

**Proposal 1: RAN2 discuss whether “both joint TCI and separate DL/UL TCI state” is not supported.**

**Proposal 2: if proposal 1 is agreed, RAN2 agree the following changes.**

* Proposal 1: indicate which TCI mode (joint or separate) should currently be used in a serving cellin the ServingCellConfig
* Proposal 2: The *tci-StateType-r17* parameter should be removed from the current RRC running CR.

**Proposal 3: if proposal 1 is not agreed, RAN2 confirms that “both joint TCI and separate DL/UL TCI state” is supported but no change is required.**

Issue 2: Support of new BFR mechanism for BM

**Proposal 4: RAN2 discuss whether new BFR mechanism can be supported for BM.**

**Proposal 5: if proposal 4 is agree, RAN2 discuss the following changes are needed ?**

* Proposal 1: RAN2 to confirm the beams associated with aTRP can be configured in candidateBeamRSList/candidateBeamRSSCellList as the candidate beams for BFR.
* Proposal 2: Network implementation ensures that the aTRP(s) are not reconfigured while it is being used by the UE for Tx/Rx. No specification impact is required to avoid the potential error case (if any).

Issue 3: simultaneousTCI-UpdateList1-r17 and simultaneousTCI-UpdateList2-r17

**Proposal 6: RAN2 confirms that Type 2 (Rel-16) common TCI state update (i.e. common MAC CE activation across multiple cells) is supported for unified TCI state framework.**

**Proposal 7: if proposal 6 is agreed, Two additional serving cell list i.e. simultaneousTCI-UpdateList1-r17 and simultaneousTCI-UpdateList2-r17 should be introduced for common TCI state update.**

Issue 4: Relationship between unified TCI framework and mTRP

**Proposal 8: RAN2 confirms that the newly introduced MAC CE for R17 unified TCI framework is not applicable to any of the configured CORESETs in a BWP if the CORESETs are configured with different CORESETPoolindex values in the BWP.**

**RRC running CR related**

**Proposal 9: RAN2 discuss whether the current running CR is enough to include SSB/PCI information.**

**Proposal 10: RAN2 discuss whether for searchSpaceLinking, in each SearchSpace, the linked SS index (SearchSpaceId) is added.**

**Proposal 11: RAN2 discuss whether existing TCI state ID space should be reused for unified TCI state for joint/DL TCI state.**

**Proposal 12: RAN2 discuss whether SI reception in inter-cell BM should be described in TS38.300 or TS 38.331.**

**Proposal 14: RAN2 discuss whether to configure csi-SSB-ResourceSet-r17 within resourcesForChannel2-r17 as CSI-SSB-ResourceSetId (i.e. instead of INTEGER (1..maxNrofCSI-SSB-ResourceSetsPerConfig).**

# Reference

1. R2-2202000, Running RRC CR for FeMIMO Rel-17, Ericsson
2. R2-2202319 Discussion on RRC aspects for feMIMO vivo discussion Rel-17 NR\_feMIMO-Core
3. R2-2202348 Systerm Information provisioning for inter-cell beam management Fujitsu discussion Rel-17 NR\_feMIMO-Core
4. R2-2202447 Discussion on FeMIMO open issues OPPO discussion Rel-17 NR\_feMIMO-Core
5. R2-2202669 Remaining issues on RRC parameters Intel Corporation discussion Rel-17 NR\_feMIMO-Core
6. R2-2202927 PUCCH power control for mTRP FR1 Samsung discussion Rel-17 NR\_feMIMO-Core
7. R2-2203041 FeMIMO RRC impact Ericsson discussion Rel-17 NR\_feMIMO-Core
8. R2-2203043 Per BWP configuration of SFN scheme Ericsson discussion Rel-17 NR\_feMIMO-Core
9. R2-2203102 Discussions on the remaining RRC issues of feMIMO CATT discussion Rel-17 NR\_feMIMO-Core
10. R2-2203103 Considerations on Inter-cell Beam Management CATT discussion Rel-17 NR\_feMIMO-Core R2-2201254
11. R2-2203126 Clarification on the serving cell measurement for mTRP Xiaomi Communications discussion Rel-17 NR\_feMIMO-Core R2-2201386
12. R2-2203263 Signaling support for UL power control for BM LG Electronics France discussion Rel-17
13. R2-2203381 FeMIMO RRC issues Huawei, HiSilicon discussion Rel-17 NR\_feMIMO-Core
14. R1-2110631, “ LS Reply on inter-cell beam management and multi-TRP in Rel-17”, RAN1
15. R2-2202348 Systerm Information provisioning for inter-cell beam management Fujitsu discussion Rel-17 NR\_feMIMO-Core