**3GPP TSG RAN WG1 #110bis-e R1-220XXXX**

**e-Meeting, October 10th – 19th, 2022**

**Agenda item:** 8.1

**Source:** Moderator (ZTE)

**Title:** Moderator Summary #2 for Maintenance on Rel-17 Multi-Beam

**Document for:** Discussion and Decision

## Introduction

The following in Section 2 and Section 3 (as agreed guidance from preparation phase for R17 multi-beam)) is assigned for discussion on maintenance of Rel-17 Multi-Beam, please provide your comments in corresponding sections.

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| [110bis-e-R17-MIMO-04] Email discussion on remaining maintenance issues on multi-beam enhancement by October 17 – Bo (ZTE)·         Issues 1-5, 1-6, 1-7, 1-14, 3-3, 3-4·         Editorial corrections for alignment CR: 1-2, 1-4, 1-9, 1-10, 1-18, 1-19, |

After first round discussion, we have good progress for several issues. Then, in this second round, let’s focus on the left-over issues: 1-6, 1-14, 3-3 and 1-18 (Editorial).

## Summary of High priority (H) issues

### Issue 1-6 Draft CR on PL-RS determination for CA case (R1-2208761, R1-2208535)

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| ***Reason for change:*** | 1. Regarding PL-RS in legacy power control scheme, UE determines an RS resource index $q\_{d}$ with a *PUSCH-PathlossReferenceRS-Id* where the RS resource is either on serving cell$c$ or, if provided, on a serving cell indicated by a value of *pathlossReferenceLinking.*

Regarding PL-RS for unified TCI state in Rel-17, the parameter *pathlossReferenceLinking* should be reused, otherwise, cross-CC PL-RS configuration can not be supported. 1. Note that in legacy power control scheme, if the parameter *pathlossReferenceLinking* is not provided, the serving cell *c* is assumed for CC ID determination for PL-RS. In Rel-15/16, it is clear that the CC which the PUSCH transmission is carried on (similar to Rel-17 TCI state applied CC) is the same as the CC where the SRI is configured (similar to Rel-17 TCI state configured CC). However, in Rel-17, the TCI state applied CC may be not same as TCI state configured CC. It needs to specify “TCI state applied CC” or “TCI state configured CC” when the parameter *pathlossReferenceLinking* is not provided to address the above ambiguity.
* In our views, “TCI state configured CC” leads to lower burden for UE measuring PL compared with “TCI state applied CC”, and is more aligned with concept of common TCI state pool among multiple CCs. We suggest to adopt “TCI state configured CC”.
1. According to TS 38.331h10, RAN2 has decided that PL-RS is included in the indicated TCI state, instead of being associated with the indicated TCI state..
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| ***Summary of change:*** | 1. Clarifying that the CC of PL-RS for an indicated TCI state can be the CC on which the indicated TCI state is configured, or, if provided, on a CC indicated by a value of *pathlossReferenceLinking*.
2. Removing the pending case that PL-RS is associated with the indicated TCI state.
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| ***Consequences if not approved:*** | 1. PL-RS for an indicated TCI state cannot support cross carrier indication. That means that each CC which has TCI state pool configuration should have individual RS configurations for PL measurement, without flexibility of parameter *pathlossReferenceLinking* for Rel-15/16 which can indicate a PCell or a SCell.
2. There is misalignment between descriptions of TS38.213 and TS38.331, regarding the inclusion of PL-RS in the indicated TCI state.
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Since having two candidate CRs, let’s try to go with R1-2208535 in this round:

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**7 Uplink Power control**

<Unchanged part omitted>

In the remaining of this clause, if a UE is provided *TCIState* in *dl-OrJoint-TCIStateList* or *UL-TCIstate* and for an indicated *TCIState* or *UL-TCIstate* as described in [6, TS 38.214]

- in clauses 7.1.1, 7.2.1, and 7.3.1, the RS index $q\_{d}$ for obtaining the downlink pathloss estimate for PUSCH, PUCCH, and SRS transmission is provided by *pathlossReferenceRS-Id-r17 ~~PL-RS~~* ~~associated with or included~~ in the indicated *TCIState* or *UL-TCIstate* except for SRS transmission that is not provided *followUnifiedTCIstateSRS* on a serving cell on which the indicated TCI state is configured, or, if provided, on a serving cell indicated by a value of *pathlossReferenceLinking*

<Unchanged part omitted>

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| **Round 2** |
| Mod\_v00 | Based on companies’ input, it seems that companies’ views are almost converged, but whether or how to update the spec is a little bit controversial. Based on that, let’s focus on technical issue itself (to avoid any ambiguities), and whether/how to update the spec may be a next step.Companies are encouraged to check the following proposals from the FL.*Proposal: Regarding cross-CC PL-RS indication in unified TCI framework, PL RS is provided by pathlossReferenceRS-Id-r17 in the indicated joint/UL-TCI state on a serving cell to which the indicated TCI state is applied, or, if provided, on a serving cell indicated by a value of pathlossReferenceLinking** *Note: Above does not imply whether there is any RAN1 spec change or not.*
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**Background from first round discussion:**

Please provide company’s view in the table below.

* If not support above CR, please clarify whether/how cross-CC PL-RS indication is support in unified TCI based on current spec.

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| Company | Comment |
| Google | OK in general, but we think the text “on a serving cell” should be moved after the words “in the indicated *TCIState* or *UL-TCIstate*”. Currently location seems to suggest this “on a serving cell” is for SRS. |
| Spreadtrum | Firstly, to clarify cross-CC PL-RS indication, we support that PL-RS ID is provided by the *TCIState* or *UL-TCIState* from a reference BWP of a reference CC.Secondly, it needs to be clarified which serving cell the PL-RS is on. The principle for serving cell determination of PL-RS in 38.213 can be reused. If the UE is provided *pathlossReferenceLinking*, the RS resource is on a serving cell indicated by a value of *pathlossReferenceLinking*. Thus, we support reusing the parameter *pathlossReferenceLinking* to indicate the serving cell for PL-RS configured in joint/UL TCI state for CA case.Thirdly, however, there is also ambiguity in the draft CR above, i.e. which *pathlossReferenceLinking* is reused, *pathlossReferenceLinking* configured on the reference CC or *pathlossReferenceLinking* configured on the CC applying the indicated TCI state? We prefer that the parameter *pathlossReferenceLinking* to be determined from the reference CC together with the PL-RS ID.Fourthly, similar to the rule of CC/BWP determination for QCL-TypeA/D source RS in 38.214 as follows, if the parameter *pathlossReferenceLinking* is not provided in the reference CC, the PL-RS is on serving cell applying the indicated TCI state.

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| When the *bwp-id* or *cell* for QCL-TypeA/D source RS in a QCL-Info of the TCI state is not configured, the UE assumes that QCL-TypeA/D source RS is configured in the CC/DL BWP where TCI state applies. |

Based on the above discussion, the following wording from the draft CR (R1-2208535) is recommended.- in clauses 7.1.1, 7.2.1, and 7.3.1, the RS resource index $q\_{d}$ for obtaining the downlink pathloss estimate for PUSCH, PUCCH, and SRS transmission is provided by *pathlossReferenceRS-Id-r17* associated with or included in the indicated *TCIState* or *UL-TCIstate* except for SRS transmission that is not provided *followUnifiedTCIstateSRS*- if the *TCIState* or *UL-TCIstate* configurations are absent in a BWP of the CC, the RS resource index $q\_{d}$ is provided by *pathlossReferenceRS-Id-r17* associated with or included in the indicated *TCIState* or *UL-TCIstate* from a reference BWP of a reference CC, where the RS resource is either on serving cell applying the indicated *TCIState* or *UL-TCIstate* or, if provided, on a serving cell indicated by a value of *pathlossReferenceLinking* configured on the reference CC. |
| Ericsson | Don’t support. This is incorrect: on which the indicated TCI state is configured It is on the serving cell where the TCI state is applied. |
| ZTE | Regarding Google’s comment, thank you for your nice suggestionRegarding Spreadtrum and E///’s comments, we are fine for either way for determining the serving cell, but we need to make a decision clearly.After that, for *pathlossReferenceLinking* parameter, it is configured per cell (no agreement for enabling this parameter can be derived from reference CC) and we do not identify the reason why we also need to consider the reference CC configuration.Based on above, we have the following update:**7 Uplink Power control**<Unchanged part omitted>In the remaining of this clause, if a UE is provided *TCIState* in *dl-OrJoint-TCIStateList* or *UL-TCIstate* and for an indicated *TCIState* or *UL-TCIstate* as described in [6, TS 38.214] - in clauses 7.1.1, 7.2.1, and 7.3.1, the RS index $q\_{d}$ for obtaining the downlink pathloss estimate for PUSCH, PUCCH, and SRS transmission is provided by *pathlossReferenceRS-Id-r17 ~~PL-RS~~* ~~associated with or included~~ in the indicated *TCIState* or *UL-TCIstate* on a serving cell on which the indicated TCI state is applied, or, if provided, on a serving cell indicated by a value of *pathlossReferenceLinking* except for SRS transmission that is not provided *followUnifiedTCIstateSRS* <Unchanged part omitted> |
| Samsung | Only the first change is needed:in clauses 7.1.1, 7.2.1, and 7.3.1, the RS index $q\_{d}$ for obtaining the downlink pathloss estimate for PUSCH, PUCCH, and SRS transmission is provided by *pathlossReferenceRS-Id-r17 ~~PL-RS~~* ~~associated with or included~~ in the indicatedThe rest is not needed. This is already described in the respective sections no need to repeat here. |
| QC | The CR seems already supported in spec. To our understanding, this part for PL calculation should be applicable to unified TCI, and this part is in parallel to it and hence should also be applicable to unified TCI. But if only we have such understanding, we are fine for the CR.- $PL\_{b,f,c}(q\_{d})$ is a downlink pathloss estimate in dB calculated by the UE using reference signal (RS) index $q\_{d}$ for the active DL BWP, as described in clause 12, of carrier $f$ of serving cell $c$- If the UE is not provided *PUSCH-PathlossReferenceRS* and *enableDefaultBeamPL-ForSRS*,or before the UE is provided dedicated higher layer parameters, the UE calculates $PL\_{b,f,c}(q\_{d})$ using a RS resource from an SS/PBCH block with same SS/PBCH block index as the one the UE uses to obtain *MIB*- If the UE is configured with a number of RS resource indexes, up to the value of *maxNrofPUSCH-PathlossReferenceRSs*, and a respective set of RS configurations for the number of RS resource indexes by *PUSCH-PathlossReferenceRS*, the set of RS resource indexes can include one or both of a set of SS/PBCH block indexes, each provided by *ssb-Index* when a value of a corresponding *pusch-PathlossReferenceRS-Id* maps to a SS/PBCH block index, and a set of CSI-RS resource indexes, each provided by *csi-RS-Index* when a value of a corresponding *pusch-PathlossReferenceRS-Id* maps to a CSI-RS resource index. The UE identifies a RS resource index $q\_{d}$ in the set of RS resource indexes to correspond either to a SS/PBCH block index or to a CSI-RS resource index as provided by *pusch-PathlossReferenceRS-Id* in *PUSCH-PathlossReferenceRS*- If the PUSCH transmission is scheduled by a RAR UL grant as described in clause 8.3, or for a PUSCH transmission for Type-2 random access procedure as described in clause 8.1A, the UE uses the same RS resource index $q\_{d}$ as for a corresponding PRACH transmission- If the UE is provided *SRI-PUSCH-PowerControl* and more than one values of *PUSCH-PathlossReferenceRS-Id*, the UE obtains a mapping from *sri-PUSCH-PowerControlId* in *SRI-PUSCH-PowerControl* between a set of values for the SRI field, or for first and second SRI fields if the UE is provided two SRS resource sets in *srs-ResourceSetToAddModList* or *srs-ResourceSetToAddModListDCI-0-2* with *usage* set to 'codebook', or values for a first SRI field and values associated with a second SRI field value corresponding to Tables 7.3.1.1.2-28/29/30/31 of [5, TS 38.212] for a same number of layers as indicated by the first SRI field value if the UE is provided two SRS resource sets in *srs-ResourceSetToAddModList* or *srs-ResourceSetToAddModListDCI-0-2* with *usage* set to 'nonCodebook', in a DCI format scheduling the PUSCH transmission and a set of *PUSCH-PathlossReferenceRS-Id* values and determines the RS resource index $q\_{d}$, or respective first and second RS resource indexes $q\_{d}$, from the value of *PUSCH-PathlossReferenceRS-Id* that is mapped to the SRI field value, or from the values of *PUSCH-PathlossReferenceRS-Id* that are mapped to respective first and second SRI field values if the UE is provided two SRS resource sets in *srs-ResourceSetToAddModList* or *srs-ResourceSetToAddModListDCI-0-2* with *usage* set to 'codebook', or from the values of *PUSCH-PathlossReferenceRS-Id* that are mapped to respective first SRI field value and a value associated with the second SRI field value corresponding to Tables 7.3.1.1.2-28/29/30/31 of [5, TS 38.212] for a same number of layers as indicated by the first SRI field value if the UE is provided two SRS resource sets in *srs-ResourceSetToAddModList* or *srs-ResourceSetToAddModListDCI-0-2* with *usage* set to 'nonCodebook', where the RS resource is either on serving cell$c$ or, if provided, on a serving cell indicated by a value of *pathlossReferenceLinking* |
| OPPO | Do not supportThe newly added part “on a serving cell on which the indicated TCI state is configured, or, if provided, on a serving cell indicated by a value of *pathlossReferenceLinking*” is not currecr and not needed too. |
| ZTE | @Samsung, please clarify which is ‘the respective sections’? Just as QC mentioned or not?@QC, we have the same questions for above. But, to be honest, we do not have a common understanding above that if our understanding is correct. For safe, we think that updated CR may be needed. @OPPP, please clarify why you think above is not needed. If so, do you think we need to support cross-CC PL indication/configuration or not? |
| Spreadtrum2 | For CA case of unified TCI framework, if cross-CC PL-RS indication is not clarified, UE behavior is unclear on how to determine PL-RS for the target CC without TCI state configuration.According to our understanding, the following issues need to be clarified:- Whether the cross-CC PL-RS indication is supported;- Whether the PL-RS ID is provided from the reference CC together with the common TCI state ID;- How to determine the PL-RS resource if PL-RS ID is determined from the reference CC;- How to determine the serving cell the PL-RS resource is on, e.g. reusing the parameter *pathlossReferenceLinking*, on the reference CC, or on the target CC?- Which *pathlossReferenceLinking* is reused if this parameter is configured on both reference CC and target CC?Thus, we think this CR is needed to align the common understanding for cross-CC PL-RS in CA case. |
| Mod\_v14 | FL Observation: Current situation is quite diverged, and @opponent companies, please review the replies from ZTE and Spreadtrum.Then, it seems that QC raised a good point which spec he raised can still apply to unified TCI or not?   |
| Apple  | We share the same view as QC that there is no new agreement made in Rel-17 unfied TCI and the legacy rule should be followed as copied below: ‘where the RS resource is either on serving cell$c$ or, if provided, on a serving cell indicated by a value of *pathlossReferenceLinking*’Regarding the need of CR, if current spec is not clear, ZTE’s CR seems implementing the above legacy behavior well and also aligned with Ericsson’s preference. We are ok to go with ZTE’s CR to implement legacy rule but extending it to unified TCI framework. |
| Mod\_v18 | No update. Look forward to other inputs. |
| vivo | We share similar views as Spreadtrum that the source of *pathlossReferenceLinking* should be clarified and for the case that the parameter *pathlossReferenceLinking* is not provided in the reference CC, the PL-RS should be determined on the serving cell applying the indicated TCI state. |

### Issue 1-14 Draft Rel-17 CR on default beam with unified TCI for cross-carrier scheduling(R1-2209937)

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| ***Reason for change:*** | As agreed in RAN1 #109e, the default beam follows the lowest CORESET ID in the latest monitored slot if the indicated TCI is associated with non-serving PCI. However, it is possible for a cross-carrier scheduled CC has indicated TCI associated with non-serving PCI and without CORESET. In this case, the default beam is unspecified.**Agreement**If scheduling offset < threshold (*timeDurationForQCL*), regardless of configuration of *followUnifiedTCIstate* 1. If the indicated TCI is associated with PCI different from serving cell PCI (i.e. inter-cell),
	1. UE should apply Rel.15 default QCL assumption for both non-UE dedicated and UE dedicated PDSCH (i.e. QCL assumption of the lowest CORESET ID in the latest slot)
	2. If the QCL-TypeD property for default beams in a slot for CCs in a band are different, the default beam for the CC with lowest ID is prioritized, i.e. the default beam for the CC with lowest ID is applied to all the CCs in a band
2. If the indicated TCI is associated with serving cell PCI (i.e. intra-cell), UE always uses indicated TCI for both UE-dedicated/non-UE-dedicated PDSCH (i.e. no need to consider default QCL)

The same approach as above is applied to default beam for aperiodic CSI-RS.Note: UE is not expected to receive a non-UE dedicated PDSCH if the source RS of the TCI state of the corresponding PDSCH is not associated with the serving cell PCID.  |
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| ***Summary of change:*** | Use the indicated TCI for a cross-carrier scheduled CC as the corresponding default beam, regardless the indicated TCI is associated with non-serving PCI or not |
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| ***Consequences if not approved:*** | The corresponding default beam is unspecified if a cross-carrier scheduled CC has indicated TCI associated with non-serving PCI and without CORESET |

Due to above, the following draft CR is provided in R1-2209937:

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**5.1.5 Antenna ports quasi co-location**

< Unchanged parts are omitted >

If the PDCCH carrying the scheduling DCI is received on one component carrier, and a PDSCH scheduled by that DCI is on another component carrier:

- The *timeDurationForQCL* is determined based on the subcarrier spacing of the scheduled PDSCH. If µPDCCH < µPDSCH an additional timing delay $d\frac{2^{μ\_{PDSCH}}}{2^{μ\_{PDCCH}}}$ is added to the *timeDurationForQCL*, where *d* is defined in 5.2.1.5.1a-1, otherwise *d* is zero;

- When the UE is configured with *enableDefaultBeamForCCS* and is not provided with *dl-OrJoint-TCIStateList-r17*, if the offset between the reception of the DL DCI and the corresponding PDSCH is less than the threshold *timeDurationForQCL,* or if the DL DCI does not have the TCI field present, the UE obtains its QCL assumption for the scheduled PDSCH from the activated TCI state with the lowest ID applicable to PDSCH in the active BWP of the scheduled cell.

- When the UE is configured with *enableDefaultBeamForCCS* and is provided with *dl-OrJoint-TCIStateList-r17*, if the offset between the reception of the DL DCI and the corresponding PDSCH is less than the threshold *timeDurationForQCL*, or if the DL DCI does not have the TCI field present, the UE obtains its QCL assumption for the scheduled PDSCH based on the indicated TCI state for the active BWP of the component carrier with the scheduled PDSCH.

< Unchanged parts are omitted >

**5.2.1.5.1 Aperiodic CSI Reporting/Aperiodic CSI-RS when the triggering PDCCH and the CSI-RS have the same numerology**

< Unchanged parts are omitted >

- If the scheduling offset between the last symbol of the PDCCH carrying the triggering DCI and the first symbol of the aperiodic CSI-RS resources in a *NZP-CSI-RS-ResourceSet* configured without higher layer parameter *trs-Info* is smaller than the UE reported threshold *beamSwitchTiming,* as defined in [13, TS 38.306], when the reported value is one of the values of {14, 28, 48}$∙2^{max(0, μ\_{CSIRS}-3)}$ and *enableBeamSwitchTiming* is not provided, or is smaller than 48$∙2^{max(0, μ\_{CSIRS}-3)}$ when the UE provides *beamSwitchTiming-r16*, *enableBeamSwitchTiming* is provided and the *NZP-CSI-RS-ResourceSet* is configured with the higher layer parameter *repetition* set to 'off' or configured without the higher layer parameter *repetition,* or is smaller than the UE reported threshold *beamSwitchTiming-r16,* when *enableBeamSwitchTiming* is provided and the *NZP-CSI-RS-ResourceSet* is configured with the higher layer parameter *repetition* set to 'on'.

- If a UE is configured with *enableDefaultTCI-StatePerCoresetPoolIndex* and the UE is configured by higher layer parameter *PDCCH-Config* that contains two different values of *coresetPoolIndex* in *ControlResourceSet*

< Unchanged parts are omitted >

- else if there is any other DL signal with an indicated TCI state in the same symbols as the CSI-RS, the UE applies the QCL assumption of the other DL signal also when receiving the aperiodic CSI-RS. The other DL signal refers to PDSCH scheduled with offset larger than or equal to the threshold *timeDurationForQCL,* as defined in [13, TS 38.306], periodic CSI-RS, semi-persistent CSI-RS, aperiodic CSI-RS in a *NZP-CSI-RS-ResourceSet* scheduled with offset larger than or equal to the UE reported threshold *beamSwitchTiming* when the reported value is one of the values {14,28,48}$∙2^{max(0, μ\_{CSIRS}-3)}$ and when *enableBeamSwitchTiming* is not provided or the *NZP-CSI-RS-ResourceSet* is configured with the higher layer parameter *trs-Info* , aperiodic CSI-RS in a *NZP-CSI-RS-ResourceSet* configuredwith the higher layer parameter *repetition* set to 'off' or configured without the higher layer parameters *repetition* and *trs-Info* scheduled with offset larger than or equal to 48$∙2^{max(0, μ\_{CSIRS}-3)}$ when the UE provides *beamSwitchTiming-r16* and *enableBeamSwitchTiming* is provided, aperiodic CSI-RS in a *NZP-CSI-RS-ResourceSet* configuredwith the higher layer parameter *repetition* set to 'on' scheduled with offset larger than or equal to the UE reported threshold *beamSwitchTiming-r16* and *enableBeamSwitchTiming* is provided;

- else if the UE is not provided *dl-OrJoint-TCIStateList-r17*, and if at least one CORESET is configured for the BWP in which the aperiodic CSI-RS is received, when receiving the aperiodic CSI-RS, the UE applies the QCL assumption used for the CORESET associated with a monitored search space with the lowest *controlResourceSetId* in the latest slot in which one or more CORESETs within the active BWP of the serving cell are monitored;

- else if the UE is provided *dl-OrJoint-TCIStateList-r17* and if the indicated TCI state is associated with a PCI different from the serving cell, regardless of configuration of *followUnifiedTCIstate*, and if at least one CORESET is configured for the BWP in which the aperiodic CSI-RS is received, when receiving the aperiodic CSI-RS, the UE applies the QCL assumption used for the CORESET associated with a monitored search space with the lowest *controlResourceSetId* in the latest slot in which one or more CORESETs within the active BWP of the serving cell are monitored. In the CA case, if the 'QCL-TypeD' of the aperiodic CSI-RSs from respective CCs in a band are different in a slot, the QCL-TypeD assumption of the CSI-RS in the CC with lowest CC ID in the band is applied to all the aperiodic CSI-RSs in the CCs in the band;

- else if the UE is provided *dl-OrJoint-TCIStateList-r17* and the indicated TCI state is associated with the PCI of the serving cell, regardless of configuration of *followUnifiedTCIstate*, the indicated TCI state is applied to the aperiodic CSI-RS;

- else if the UE is configured with *enableDefaultBeamForCCS* and is not provided with *dl-OrJoint-TCIStateList-r17*, and when receiving the aperiodic CSI-RS, the UE applies the QCL assumption of the lowest-ID activated TCI state applicable to the PDSCH within the active BWP of the cell in which the CSI-RS is to be received.

- else if the UE is configured with *enableDefaultBeamForCCS* and is provided with *dl-OrJoint-TCIStateList-r17*, and when receiving the aperiodic CSI-RS, the UE applies the QCL assumption based on the indicated TCI state for the active BWP of the cell in which the CSI-RS is to be received.

< Unchanged parts are omitted >

**5.2.1.5.1a Aperiodic CSI Reporting/Aperiodic CSI-RS when the triggering PDCCH and the CSI-RS have different numerologies**

When the triggering PDCCH and the triggered aperiodic CSI-RS are of different numerologies, the behavior defined in 5.2.1.5.1 for the case where the numerologies are the same applies with the following exceptions:

Beam switch timing:

< Unchanged parts are omitted >

- if one of the associated trigger states has the higher layer parameter *qcl-Type* set to 'typeD',

- if there is any other DL signal with an indicated TCI state in the same symbols as the CSI-RS, the UE applies the QCL assumption of the other DL signal also when receiving the aperiodic CSI-RS. The other DL signal refers to PDSCH scheduled with offset larger than or equal to the threshold *timeDurationForQCL,* as defined in [13, TS 38.306], periodic CSI-RS, semi-persistent CSI-RS, aperiodic CSI-RS scheduled with offset larger than or equal to *beamSwitchTiming* + *d* $∙2^{μ\_{CSIRS}}/2^{μ\_{PDCCH}}$ in CSI-RS symbols when the reported value is one of the values {14,28,48}$∙2^{max(0, μ\_{CSIRS}-3)}$ and when *enableBeamSwitchTiming* is not provided or the *NZP-CSI-RS-ResourceSet* is configured with the higher layer parameter *trs-Info*, aperiodic CSI-RS in a *NZP-CSI-RS-ResourceSet* configuredwith the higher layer parameter *repetition* set to 'off' or configured without the higher layer parameters *repetition* and *trs-Info* scheduled with offset larger than or equal to 48$∙2^{max⁡(0, μ\_{CSIRS}-3)}$+ $d∙2^{μ\_{CSIRS}}/2^{μ\_{PDCCH}}$ in CSI-RS symbols when the UE provides *beamSwitchTiming-r16* and *enableBeamSwitchTiming* is provided, aperiodic CSI-RS in a *NZP-CSI-RS-ResourceSet* configuredwith the higher layer parameter *repetition* set to 'on' and scheduled with offset larger than or equal to *beamSwitchTiming-r16* + *d* $∙2^{μ\_{CSIRS}}/2^{μ\_{PDCCH}}$in CSI-RS symbols when *enableBeamSwitchTiming* is provided;

- else,

- if at least one CORESET is configured for the BWP in which the aperiodic CSI-RS is to be received, when receiving the aperiodic CSI-RS, the UE applies the QCL assumption used for the CORESET associated with a monitored search space with the lowest *controlResourceSetId* in the latest slot in which one or more CORESETs within the active BWP of the serving cell are monitored.

- else if the UE is configured with *enableDefaultBeamForCCS* and is not provided with *dl-OrJoint-TCIStateList-r17*, when receiving the aperiodic CSI-RS, the UE applies the QCL assumption of the lowest-ID activated TCI state applicable to the PDSCH within the active BWP of the cell in which the CSI-RS is to be received.

- else if the UE is configured with *enableDefaultBeamForCCS* and is provided with *dl-OrJoint-TCIStateList-r17*, when receiving the aperiodic CSI-RS, the UE applies the QCL assumption based on the indicated TCI statefor the active BWP of the cell in which the CSI-RS is to be received.

< Unchanged parts are omitted >

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FL note: After reviewing current spec, from the FL perspective, the above issue is valid.

* BTW, ‘dl-OrJoint-TCIStateList-r17’ is incorrect and has been replaced by legacy TCI state. But, in this round, let’s focus on the logic/technical issue of this CR, and once above can be supported in general, I will make the corresponding update accordingly.

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| **Round 2** |
| Mod\_v00 | Thank you so much for good discussion. After first round discussion, companies’ views are still diverged. Since there is no further update from proponent companies, we may have to close this email discussion. Any way-forward suggestions are highly appreciated.  |
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**Background from first round discussion:**

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| Company | Comment |
| Google | It seems the CR is not aligned with the agreements. In the agreement, the default beam is different for inter-cell and intra-cell. In addition, the highlighted text below seems to be unnecessary.When the UE is configured with *enableDefaultBeamForCCS* and is provided with *dl-OrJoint-TCIStateList-r17*, if the offset between the reception of the DL DCI and the corresponding PDSCH is less than the threshold *timeDurationForQCL*, or if the DL DCI does not have the TCI field present, the UE obtains its QCL assumption for the scheduled PDSCH based on the indicated TCI state for the active BWP of the component carrier with the scheduled PDSCH. |
| Ericsson  | Support, with two comments:* Note that we do not include a suffix -r17 in RRC field names if there is no risk for ambiguity. So please replace *dl-OrJoint-TCIStateList-r17* with *dl-OrJoint-TCIStateList*
* Why do we need the statement

if the offset between the reception of the DL DCI and the corresponding PDSCH is less than the threshold *timeDurationForQCL* doesn’t the UE always apply the indicated TCI in this case? |
| ZTE | We are okay for the direction of this CR. But we think that the following bullet may not be necessary, and seems to be duplicated with the general description for PDSCH and CSI-RS, i.e., apply the indicated TCI for PDSCH/CSI-RS. Anything new?- When the UE is configured with *enableDefaultBeamForCCS* and is provided with *dl-OrJoint-TCIStateList-r17*, if the offset between the reception of the DL DCI and the corresponding PDSCH is less than the threshold *timeDurationForQCL*, or if the DL DCI does not have the TCI field present, the UE obtains its QCL assumption for the scheduled PDSCH based on the indicated TCI state for the active BWP of the component carrier with the scheduled PDSCH.…- else if the UE is configured with *enableDefaultBeamForCCS* and is provided with *dl-OrJoint-TCIStateList-r17*, and when receiving the aperiodic CSI-RS, the UE applies the QCL assumption based on the indicated TCI state for the active BWP of the cell in which the CSI-RS is to be received.…- else if the UE is configured with *enableDefaultBeamForCCS* and is provided with *dl-OrJoint-TCIStateList-r17*, when receiving the aperiodic CSI-RS, the UE applies the QCL assumption based on the indicated TCI statefor the active BWP of the cell in which the CSI-RS is to be received. |
| Samsung | This seems to be defining a new behavior that goes beyond the agreement. We don’t support introducing this in the maintenance phase. |
| QC | Based on FL and Yushu’s suggestion, the proposal is described below in red on top of agreement. If the proposal is agreeable, the CR can be polished accordingly. To SS, we think UE needs to know what to do in this case. What you proposed seems to say default beam is not supported in this case. But I think this is even worse than R16 and should also be stated in spec, e.g. offset should > threshold.**Proposal in red on top of agreement**If scheduling offset < threshold (*timeDurationForQCL*), regardless of configuration of *followUnifiedTCIstate* 1. If the indicated TCI is associated with PCI different from serving cell PCI (i.e. inter-cell),
	1. UE should apply Rel.15 default QCL assumption for both non-UE dedicated and UE dedicated PDSCH (i.e. QCL assumption of the lowest CORESET ID in the latest slot)
	2. If there is no CORESET on CC with scheduled PDSCH in case of cross-carrier scheduling, UE uses indicated TCI for scheduled PDSCH
	3. If the QCL-TypeD property for default beams in a slot for CCs in a band are different, the default beam for the CC with lowest ID is prioritized, i.e. the default beam for the CC with lowest ID is applied to all the CCs in a band
2. If the indicated TCI is associated with serving cell PCI (i.e. intra-cell), UE always uses indicated TCI for both UE-dedicated/non-UE-dedicated PDSCH (i.e. no need to consider default QCL)

The same approach as above is applied to default beam for aperiodic CSI-RS. |
| OPPO | Do not support the CR. The change does not align with the agreement. We can not have new design here. The purpose of the CR is to capture the agreement, not to make new agreement. |
| Google | We suggest the following change on top of the version from Yan to be aligned with the agreement.If scheduling offset < threshold (*timeDurationForQCL*), regardless of configuration of *followUnifiedTCIstate* 1. If the indicated TCI is associated with PCI different from serving cell PCI (i.e. inter-cell),
	1. UE should apply Rel.15 default QCL assumption for both non-UE dedicated and UE dedicated PDSCH (i.e. QCL assumption of the lowest CORESET ID in the latest slot; for cross-carrier scheduling, if *enableDefaultBeamForCCS* is configured, the default PDSCH beam is based on the activated TCI with lowest ID in the active BWP of the CC with the PDSCH)
	2. ~~If there is no CORESET on CC with scheduled PDSCH in case of cross-carrier scheduling, UE uses indicated TCI for scheduled PDSCH~~
	3. If the QCL-TypeD property for default beams in a slot for CCs in a band are different, the default beam for the CC with lowest ID is prioritized, i.e. the default beam for the CC with lowest ID is applied to all the CCs in a band
2. If the indicated TCI is associated with serving cell PCI (i.e. intra-cell), UE always uses indicated TCI for both UE-dedicated/non-UE-dedicated PDSCH (i.e. no need to consider default QCL)
 |
| Mod\_v14 | FL Observation: Current situation is quite diverged, and @opponent companies, please review the updated proposal from QC and Google. From FL’s perspective, it may not good to introduce a new feature unless having a clear consensus, but correcting some error for making the unified TCI work well for ‘cross-carrier scheduling, if enableDefaultBeamForCCS is configured, the default PDSCH beam is based on the activated TCI with lowest ID in the active BWP of the CC with the PDSCH)’ seems fine. Then, can we assume that the following conclusion is sufficient for all cross-carrier scheduling (of course, regardless of ‘enableDefaultBeamForCSS’ or not).**Conclusion**On Rel-17 unified TCI framework, if a UE is configured with CrossCarrierSchedulingConfig for a serving cell the value of the DCI field ‘carrier indicator’ corresponds to the value indicated by CrossCarrierSchedulingConfig. * The codepoint indicated by the DCI field ‘Transmission Configuration Indicator’ is applied to the carrier indicated by the DCI field ‘carrier indicator’ and all CCs configured in a same CC list as that carrier, and corresponds to indicated TCI state configured and activated for that carrier and all CCs, respectively.
 |
| Huawei, HiSilicon | We prefer to continue discussion on this. The original CR is not aligned with the current agreement and further discussion seem necessary before adjusting the agreement based on QC or Google proposals. |
| Apple  | We prefer to first conclude whether needs to introduce new agreement. On the PDSCH cross-carrier scheduled on SCell, it is all UE-dedicated PDSCH. Following design principle, it is nature to follow the indicated TCI state as proposed by QC. On the other hand, we are not sure whether CR addresses all potential issues. For example, two CCs, CC1 is scheduling CC and CC2 is a scheduled CC. There are two overlapped PDSCH#1 on CC1 and PDSCH#2 on CC2, where the offset between the reception of the DL DCI and the corresponding PDSCH is less than the threshold timeDurationForQCL. Following the proposed CR, PDSCH#1 follow legacy rule and TCI state is determined based on the recent PDCCH. While PDSCH#2 TCI is determined based on the indicated TCI state. What is the UE behavior if these two TCI states are different? With this consideration, it seems make sense to keep a consistent behavior for scheduling CC and scheduled CC. Therefore, CR maybe not needed. In any case, the conclusion proposed by FL is unclear for us and therefore not preferred. We thanks FL great efforts and fully understand the intention is to find something in the middle to progress. However, it makes thing a bit unclear. For example, in CA framework, even a serving cell can configure ‘CrossCarrierSchedulingConfig’ IE with setting ‘own’ value since LTE phase, which is claimed by infra-vendor to align the DCI sizes between scheduling CC and scheduled CC with both including CIF field and benefits scheduler design. In this case, the conclusion is directly contradicted with the existing agreement since the indicated TCI is applied to the scheduling CC even the gap is smaller than timeDurationForQCL. In summary, we prefer to focus on the CR and candidate proposal, which can directly address the problem. We are open to other conclusion e.g., support or not support this enhancement to avoid confusion.  |
| Mod\_v18 | No update. Thanks for Huawei and especially Apple’s clarification. Look forward to other inputs. @QC, any way-forward suggestions? |
| Spreadtrum | A new agreement is needed based on QC or Google proposals. We slightly prefer Google’s proposal which is similar to the existing agreement of PDSCH default beam and the current principle of cross carrier PDSCH scheduling, e.g. follow the activated TCI state with lowest ID for PDSCH. |
| vivo | We are fine for the CR with revision from the Ericsson’s modification. |
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### Issue 3-3 Draft CR 38.214 Rel-17 multi-beam enhancements\_beam switch HARQ (R1-2210057)

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| --- | --- |
| ***Reason for change:*** | The current specification is not clear on the application time of the beam indication (indicated TCI state). |
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| ***Summary of change:*** | In section 5.1.5 of 38.214 it should be clarified that the UE applies the Indicated TCI state carried in the latest-in-time DCI for which the UE sends HARQ-ACK. |
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| ***Consequences if not approved:*** | The specifications would be incomplete regarding the DCI based beam switch when applied under the Rel-17 unified TCI framework. |

Due to above, the following draft CR is provided in R1-2210057:

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**5.1.5 Antenna ports quasi co-location**

< Unchanged parts are omitted >

When the UE would transmit the last symbol of a PUCCH with HARQ-ACK information corresponding to the latest in time DCI carrying the TCI State indication and without DL assignment, or corresponding to the PDSCH scheduling by the DCI carrying the TCI State indication, and if the indicated TCI State is different from the previously indicated one, the indicated *DLorJointTCIState* or *UL-TCIstate* should be applied starting from the first slot that is at least $BeamAppTime\\_r17$ symbols after the last symbol of the PUCCH. The first slot and the $BeamAppTime\\_r17$ symbols are both determined on the carrier with the smallest SCS among the carrier(s) applying the beam indication.

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| **Round 2** |
| Mod\_v00 | Based on companies’ input, majority companies tend to clarify ‘the lowest CC ID’, and so let’s try to go with majority views (based on Apple and Google’s version).* @vivo, thank you so much for your nice suggestion in the first round. If my understanding is correct, ‘the indicated TCI State in the latest DCI occasion with the lowest CC ID is different from the previously indicated one’ you highlighted may not be relevant to this discussion.

----------------------------------------------------------------------------------------------**5.1.5 Antenna ports quasi co-location**< Unchanged parts are omitted >When the UE would transmit the last symbol of a PUCCH with HARQ-ACK information corresponding to the lowest CC ID in the latest occasion in which one or more DCIs carrying the TCI State indication and without DL assignment, or corresponding to the PDSCH scheduling by the DCI carrying the TCI State indication, and if the indicated TCI State is different from the previously indicated one, the indicated *DLorJointTCIState* or *UL-TCIstate* should be applied starting from the first slot that is at least $BeamAppTime\\_r17$ symbols after the last symbol of the PUCCH. The first slot and the $BeamAppTime\\_r17$ symbols are both determined on the carrier with the smallest SCS among the carrier(s) applying the beam indication.---------------------------------------------------------------------------------------------- |
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**Background from first round discussion:**

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| --- | --- |
| Company | Comment |
| Google | If we consider the CA operation, UE may receive DCI from multiple CCs. In that case, how to count the “latest in time” for the DCIs received from multiple CCs? |
| Ericsson | Support |
| ZTE | We are fine in general. A short question for clarification: what’s difference if not having ‘latest in time’? Eitherway, the corresponding PUCCH with HARQ-ACK should be the same, right? |
| Samsung | I am afraid that this adds more ambiguity. When we say “latest in time”, is it the time of beam application, or the time of HARQ-ACK reply. If UE receives DCI A at time t1. It acknowledges DCI A at time t2 and the beam should be applied at time t3=t2+BAT. Now if the UE receives a second DCI at time t4, where t4 is less than t3, is that DCI considered the latest in time.We sympathize the need for this change to make the specs clearer, maybe we can say:When the UE would transmit the last symbol of a PUCCH with HARQ-ACK information corresponding to the ~~latest in time~~ DCI carrying the TCI State indication and without DL assignment, or corresponding to the PDSCH scheduling by the DCI carrying the TCI State indication, and if the indicated TCI State is different from the previously indicated one, the indicated *DLorJointTCIState* or *UL-TCIstate* should be applied starting from the first slot that is at least $BeamAppTime\\_r17$ symbols after the last symbol of the PUCCH. The first slot and the $BeamAppTime\\_r17$ symbols are both determined on the carrier with the smallest SCS among the carrier(s) applying the beam indication. The UE applies the indicated *TCIState* or *UL-TCIstate* of the latest in time DCI that satisfies the $BeamAppTime\\_r17$ condition. |
| QC | Support in principle. However, the latest DCI may still have ambiguity. Is it based on the start or end of DCI, especially with DCI repetition? Therefore, we suggest to the following change, which is based on the start of DCI, e.g. UE obeys the DCI whose start is latest. information corresponding to the latest ~~in time~~ occasion across CCs with DCI carrying |
| Google | QC’s suggest may still have some problems. There can be multiple DCIs from the CCs at the same time. Maybe it can be revised as follows:information corresponding to the latest ~~in time~~ occasion across CCs with DCI carrying, if there are multiple DCIs, the one in the CC the lowest ID is applied |
| LG | Similar understanding with ZTE |
| Mod\_v14 | @ZTE and LGE, it should be better if proponent companies can clarify this issue. From my perspective, if my understanding is correct, this CR is relevant to the case that the PUCCH is related to a list of DCI(s) carrying the respective indicated TCI state(s). Then, which TCI state should be assumed as a valid TCI state. If so, it is not relevant to BAT timeline at all.Then, can we go with original version, and then for CA case, we may have a separate discussion? But of course, if supported by majority companies now, it is definitely good that we can make it done right now. |
| Apple  | We support the modification from Google, which seems more complete. The following wording is provided for consideration: information corresponding to the lowest CC ID in the latest ~~in time~~ occasion in which one or more DCIs carrying |
| Mod\_v18 | No update. Initially I thought that we only focused on the basic issue for a serving cell case (afraid that it may be over-designed), but it seems a lot of companies are interested in the CA case. Then let’s check the following two candidates. Look forward to any further inputs.Option-1(from QC):… information corresponding to the latest ~~in time~~ occasion across CCs with DCI carrying…Option-2 (from Apple and Google)… information corresponding to the lowest CC ID in the latest ~~in time~~ occasion in which one or more DCIs carrying… |
| Spreadtrum | Maybe we can go with original version firstly, and the CA case can be discussed further. But, two options in Mod\_v18 is fine for us. |
| vivo | We are fine to finalize the issue with a complete solution. We suggest the follow wording, please check whether it is clearer.When the UE would transmit the last symbol of a PUCCH with HARQ-ACK information corresponding to the DCI(s) carrying the TCI State indication and without DL assignment, or corresponding to the PDSCH scheduling by the DCI carrying the TCI State indication, and if the indicated TCI State in the latest DCI occasion with the lowest CC ID is different from the previously indicated one, the indicated *DLorJointTCIState* or *UL-TCIstate* should be applied starting from the first slot that is at least $BeamAppTime\\_r17$ symbols after the last symbol of the PUCCH. The first slot and the $BeamAppTime\\_r17$ symbols are both determined on the carrier with the smallest SCS among the carrier(s) applying the beam indication. |
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## Summary of Editorial (E) issues

The left-over editorial CR after first round is provided in:

[https://www.3gpp.org/ftp/tsg\_ran/WG1\_RL1/TSGR1\_110b-e/Inbox/drafts/8.1(NR\_feMIMO)/Multi-Beam/Round%202/Editorial%20issues%20(left-over)](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_110b-e/Inbox/drafts/8.1%28NR_feMIMO%29/Multi-Beam/Round%202/Editorial%20issues%20%28left-over%29)

Companies are to share their inputs on the editorial CR for the following issues herein.

### Issue 1-18

* Correction on indicated TCI state (ASUSTeK)

Table 1 Companies’ inputs

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| **Round 2** |
| Mod\_v00 | @Samsung, please review ASUSTek’s reply as in the following table from first round. [Issue 1-18, R1-221xxxx Correction on indicated TCI state\_v0.docx](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_110b-e/Inbox/drafts/8.1%28NR_feMIMO%29/Multi-Beam/Round%202/Editorial%20issues%20%28left-over%29/Issue%201-18%2C%20R1-221xxxx%20Correction%20on%20indicated%20TCI%20state_v0.docx)Can you be flexible based on current situation and ASUSTek’s reply? If not, we have to close this discussion and reject the CR. |
|  |  |

**Background from first round discussion:**

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| --- | --- |
| Company | Comment |
| Mod\_V00 | The draft CR for endorsement is in:[Issue 1-18, R1-221xxxx Correction on indicated TCI state\_v0.docx](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_110b-e/Inbox/drafts/8.1%28NR_feMIMO%29/Multi-Beam/Round%201/Editorial%20issues/Issue%201-18%2C%20R1-221xxxx%20Correction%20on%20indicated%20TCI%20state_v0.docx) |
| ZTE | Support |
| Samsung | Not need. A or B is true if A only is true or B only is true is both A and B are true. Adding “and” is redundant. |
| QC | Support |
| Lenovo | Support |
| LG | Fine |
| Mod\_v14 | If companies have concerns on this CR finally, we may have rejected it. |
| Huawei, HiSilicon | Support |
| ASUSTeK | ProponentWe think it would be better to capture this editorial change to align the logic in another description (shown below) in Sec. 5.1 in current TS 38.214.If the activation command maps *TCIState* and/or *UL-TCIState* to only one TCI codepoint, the UE shall apply the indicated *TCIState* and/or *UL-TCIState* to one or to a set of CCs /DL BWPs, and if applicable, to one or to a set of CCs /UL BWPs once the indicated mapping for the one single TCI codepoint is applied as described in [11, TS 38.133].Given majority company seems fine with this editorial change, could Samsung be flexible on this editorial change? |
| Mod\_v18 | @Samsung, please review ASUSTek’s reply. Can you be flexible based on current situation and ASUSTek’s reply? |

## Conclusion

# References

|  |  |  |  |
| --- | --- | --- | --- |
| 1 | [**R1-2208534**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_110b-e/Docs/R1-2208534.zip) | Draft CR on PL-RS for unified TCI framework | Spreadtrum Communications |
| 2 | [**R1-2208535**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_110b-e/Docs/R1-2208535.zip) | Draft CR on PL-RS determination for CA case | Spreadtrum Communications |
| 3 | [**R1-2208588**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_110b-e/Docs/R1-2208588.zip) | Discussion on the QCL assumption of the PDSCH not following the indicated TCI state | vivo |
| 4 | [**R1-2208589**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_110b-e/Docs/R1-2208589.zip) | Draft CR on the QCL assumption of the PDSCH not following the indicated TCI state | vivo |
| 5 | [**R1-2208590**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_110b-e/Docs/R1-2208590.zip) | Draft CR on the rate match mechanism for PDSCH for inter-cell beam measurement | vivo |
| 6 | [**R1-2208591**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_110b-e/Docs/R1-2208591.zip) | Draft CR on the UE behavior when PDCCH candidate overlaps with SSBs for inter-cell beam measurement in the same Res | vivo |
| 7 | [**R1-2208751**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_110b-e/Docs/R1-2208751.zip) | Draft CR on beam indication of SRS resource on unified TCI framework to TS38.214 | Lenovo |
| 8 | [**R1-2208753**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_110b-e/Docs/R1-2208753.zip) | Draft CR on noncodebook SRS resource on unified TCI framework to TS38.214 | Lenovo |
| 9 | [**R1-2208754**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_110b-e/Docs/R1-2208754.zip) | Draft CR on reference of MAC CE in TS38.321 for SRS resource on unified TCI framework to TS38.214 | Lenovo |
| 10 | [**R1-2208756**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_110b-e/Docs/R1-2208756.zip) | Draft CR on PHR with unified TCI in TS 38.213 | Lenovo |
| 11 | [**R1-2208761**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_110b-e/Docs/R1-2208761.zip) | Draft CR on cross CC power control for unified TCI in TS 38.213 | ZTE |
| 12 | [**R1-2208762**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_110b-e/Docs/R1-2208762.zip) | Draft CR on SRS closed loop power control shared with PUSCH in TS 38.213 | ZTE |
| 13 | [**R1-2208789**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_110b-e/Docs/R1-2208789.zip) | Corrections on TCI indication of CORESET not following unified TCI state | OPPO |
| 14 | [**R1-2208790**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_110b-e/Docs/R1-2208790.zip) | Corrections on activated TCI state in Unified TCI framework | OPPO |
| 15 | [**R1-2208791**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_110b-e/Docs/R1-2208791.zip) | Corrections on TCI indication of SRS in Unified TCI framework | OPPO |
| 16 | [**R1-2208871**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_110b-e/Docs/R1-2208871.zip) | Clarification on active BWP for beam application time | Google |
| 17 | [**R1-2208889**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_110b-e/Docs/R1-2208889.zip) | Draft CR on UL PC with common TCI state pool for CA | LG Electronics |
| 18 | [**R1-2208918**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_110b-e/Docs/R1-2208918.zip) | On joint DL/UL TCI state update in unified TCI framework | CATT |
| 19 | [**R1-2209228**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_110b-e/Docs/R1-2209228.zip) | Draft CR on QCL source for CSI-RS | NEC |
| 20 | [**R1-2209539**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_110b-e/Docs/R1-2209539.zip) | Correction on beam activation and update for multiple CCs | Google |
| 21 | [**R1-2209559**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_110b-e/Docs/R1-2209559.zip) | Maintenance on Further enhancements on MIMO for NR | Apple |
| 22 | [**R1-2209824**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_110b-e/Docs/R1-2209824.zip) | Correction on conflict resolution for PUSCH TCI-state | Huawei, HiSilicon |
| 23 | [**R1-2209825**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_110b-e/Docs/R1-2209825.zip) | Correction on default power control parameters | Huawei, HiSilicon |
| 24 | [**R1-2209937**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_110b-e/Docs/R1-2209937.zip) | Draft CR on default beam with unified TCI for cross-carrier scheduling | Qualcomm Incorporated |
| 25 | [**R1-2209938**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_110b-e/Docs/R1-2209938.zip) | Draft CR on SRS power control parameters with unified TCI | Qualcomm Incorporated |
| 26 | [**R1-2209939**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_110b-e/Docs/R1-2209939.zip) | Draft CR on reset accumulation of TPC adjustment state for unified TCI | Qualcomm Incorporated |
| 27 | [**R1-2210056**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_110b-e/Docs/R1-2210056.zip) | Draft CR 38.213 Rel-17 CORESET Configured with CSS and Follow Unified TCI State | Nokia, Nokia Shanghai Bell |
| 28 | [**R1-2210057**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_110b-e/Docs/R1-2210057.zip) | Draft CR 38.214 Rel-17 multi-beam enhancements\_beam switch HARQ | Nokia, Nokia Shanghai Bell |
| 29 | [**R1-2210058**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_110b-e/Docs/R1-2210058.zip) | Draft CR 38.214 Rel-17 multi-beam enhancements\_CG PUSCH type 1 | Nokia, Nokia Shanghai Bell |
| 30 | [**R1-2210079**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_110b-e/Docs/R1-2210079.zip) | Draft CR for TCI state parameter name alignment in TS 38.213 | ASUSTeK |
| 31 | [**R1-2210081**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_110b-e/Docs/R1-2210081.zip) | Draft CR for TCI state parameter name alignment in TS 38.214 | ASUSTeK |
| 32 | [**R1-2210083**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_110b-e/Docs/R1-2210083.zip) | Correction on indicated TCI state | ASUSTeK |
| 33 | [**R1-2210088**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_110b-e/Docs/R1-2210088.zip) | Draft CR to 38.213 on UL TCI state parameter naming | Ericsson |
| 34 | [**R1-2210089**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_110b-e/Docs/R1-2210089.zip) | Draft CR to 38.214 on UL TCI state parameter naming | Ericsson |
| 35 | [**R1-2210090**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_110b-e/Docs/R1-2210090.zip) | Draft CR to 38.213 on unified TCI for PDSCH | Ericsson |
| 36 | [**R1-2210202**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_110b-e/Docs/R1-2210202.zip) | Correction on DCI based TCI indication for cross carrier scheduling | Huawei, HiSilicon |
| 37 | [**R1-2210215**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_110b-e/Docs/R1-2210215.zip) | Clarifying the ambiguous usage of TCI-State | Huawei, HiSilicon |
| 38 | [**R1-2210216**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_110b-e/Docs/R1-2210216.zip) | UL TCI state parameter name alignment | Huawei, HiSilicon |
|  |  |  |  |