**3GPP TSG RAN WG1 #117 DRAFT R1-** **2405474**

**Fukuoka, Japan, May 20th – 24th, 2024**

**Agenda item:** 8.1

**Source:** Moderator (MediaTek Inc.)

**Title:** Moderator summary for maintenance of Rel-18 MIMO on unified TCI extension (Round 1)

**Document for:** Discussion and Decision

# Introduction

In this summary, the followings are provided based on the contributions from companies [1]-[22],

* Summary of companies’ views on each of maintenance issues raised by interested companies, where the maintenance issues are categorized as follow:
	+ Issue 1 – Maintenance issue on unified TCI extension
	+ Issue 2 – Maintenance issue on UL power control for UL MTRP operation
* Observations/assessments on maintenance issue(s) based on the summary of companies’ views. An assessment as follows is provided to each maintenance issue in this summary, and it can be revised based on further companies’ input to this summary:
	+ Critical (C): this includes high-priority issue (essential, pending issues, broken spec components) or editorial change that either enhances the clarity of the specs or corrects mistakes in the specs
	+ Non-essential (N): this includes all other purposes such as spec optimization and low-priority issues
	+ Editorial (E): this includes editorial issues that will be handled as editorial CRs
* Text proposal(s) would be provided for maintenance issue(s) with critical (C) and editorial (E)

# Text proposal to be discussed online

Based on the summary of companies’ views in Round 0 summary, the following text proposals are provided for those maintenance issues identified as “C” or “E”. Please provide your comment, if any, to these text proposals to Table 0.

**Text Proposal 1.5**

Adopt the following text proposal to TS 38.213 V18.2.0 Section 5.1.5:

* Reason for change: For cjtSchemeB, “joint TCI state” is used to represent the second indicated TCI state. However, in current TS 38.214, “TCI-state” should be used to represent j joint/DL TCI state.
* Summary of change: Change “joint TCI state” to “TCI-state”
* Consequences if not approved: Non-uniform expression to represent joint/DL TCI state in TS 38.214

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| 5.1.5 Antenna ports quasi co-location-------------------------------------------Unchanged parts are omitted------------------------------------------When a UE is configured by higher layer parameter *cjtSchemePDSCH* and *dl-OrJointTCI-StateList* and is indicated with two TCI-States applied for PDSCH reception and reports [support for two joint TCI states for PDSCH-CJT]:- if the UE is configured with *cjtSchemeA*, the UE assumes that PDSCH DM-RS port(s) are QCLed with the DL RSs of both indicated TCI-States with respect to QCL-TypeA. - if the UE is configured with *cjtSchemeB*, the UE assumes that PDSCH DM-RS port(s) are QCLed with the DL RSs of both indicated TCI-States with respect to QCL-TypeA except for QCL parameters {Doppler shift, Doppler spread} of the second indicated ~~joint TCI state~~TCI-State.-------------------------------------------Unchanged parts are omitted------------------------------------------ |

**Text Proposal 1.3 for S-DCI based MTRP**

Adopt the following text proposal to TS 38.214 V18.2.0 Section 5.1.5:

* Reason for change: In the case that a UE can NOT support two default beams, for S-DCI based MTRP operation, the UE should use the first indicated TCI state to a PDSCH reception with scheduling offset smaller than a threshold. However, the PDSCH may be overlapped with a PDCCH reception in a same OFDM symbol which may use different TCI state(s) from the first indicated TCI state. As in legacy procedure, we should clarify the corresponding priority rule for the PDCCH reception.
* Summary of change: Clarifying that the PDCCH reception should be prioritized once the PDSCH with offset smaller than a threshold is associated with different TCI states/QCL properties from PDCCH reception.
* Consequences if not approved: Once a PDCCH is overlapped with a PDSCH with scheduling offset smaller than a threshold in an OFDM symbol, UE behavior of PDCCH and PDSCH reception with scheduling offset smaller than a threshold is unclear.

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| 5.1.5 Antenna ports quasi co-location-------------------------------------------Unchanged parts are omitted------------------------------------------When a UE is configured with *dl-OrJointTCI-StateList* and is having two indicated TCI-states, when the offset between the reception of the scheduling/activation DCI format 1\_0/1\_1/1\_2 and the scheduled or activated PDSCH reception is less than *timeDurationForQCL* in frequency range 2, and if the PDSCH and a PDCCH overlaps in at least one symbol- If the UE does not report its capability of *defaultQCL-TwoTCI*, and if the 'QCL-TypeD' of the PDSCH DMRS is different from any one of those of PDCCH DMRS, the UE is expected to prioritize the reception of PDCCH.-------------------------------------------Unchanged parts are omitted------------------------------------------ |

**Text Proposal 1.3 for M-DCI based MTRP**

Adopt the following text proposal to TS 38.214 V18.2.0 Section 5.1.5:

* Reason for change: In the case that a UE can NOT support two default beams, for M-DCI based MTRP operation, the UE should use the first indicated TCI state specific to *coresetPoolIndex* value 0 to a PDSCH reception with scheduling offset smaller than a threshold, and UE does not expect that the PDSCH with scheduling offset smaller than a threshold is scheduled by a CORESET associated with *coresetPoolIndex* value 1. However, the PDSCH may be overlapped with a PDCCH reception in a same OFDM symbol which may use different TCI state(s) from the first indicated TCI state. As in legacy procedure, we should clarify the corresponding priority rule for the PDCCH reception.
* Summary of change: Clarifying that the PDCCH reception should be prioritized once the PDSCH with offset smaller than a threshold is associated with different TCI states/QCL properties from PDCCH reception.
* Consequences if not approved: Once a PDCCH is overlapped with a PDSCH with scheduling offset smaller than a threshold in an OFDM symbol, UE behavior of PDCCH and PDSCH reception with scheduling offset smaller than a threshold is unclear.

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| 5.1.5 Antenna ports quasi co-location-------------------------------------------Unchanged parts are omitted------------------------------------------When a UE is configured with *dl-OrJointTCI-StateList,* is configured by higher layer parameter *PDCCH-Config* that contains two different values of *coresetPoolIndex* in *ControlResourceSet* and is having two indicated TCI-states, when the offset between the reception of the scheduling/activation DCI format 1\_0/1\_1/1\_2 and the scheduled or activated PDSCH reception is less than *timeDurationForQCL* in frequency range 2, and if the PDSCH and a PDCCH overlaps in at least one symbol- If the UE does not report its capability of *defaultQCL-PerCORESETPoolIndex*, and if the 'QCL-TypeD' of the PDSCH DMRS is different from that of PDCCH DMRS, the UE is expected to prioritize the reception of PDCCH.-------------------------------------------Unchanged parts are omitted------------------------------------------ |

**Proposal 2.5**

On Rel-18 unified TCI framework for MTRP operation, the Rel-17 enhancement of a second TPC command field in DCI for both multi-TRP PUCCH and PUSCH operations can be reused

* Note: No specification change is needed

**Table 0 Company inputs for text proposals**

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| **Company** | **Input** |
| Mod | Note that the description of configuration of Rel-18 unified TCI framework in Text Proposal 2.1 just follows the same description used for two PHR mode used in Rel-18 S-DCI based STxMP. |
| NEC | We are fine with the proposals, and if they are agreed, we just suggest to keep some unchanged paragraph to make it clear where the new added TP is inserted.Besides, regarding the TP in [R1-2404673](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_117/Docs/R1-2404673.zip), after online discussion, we are fine without changing to italic, but there is one place to be changed for CJT TCI state, in the same paragraph, only in the last sentence in the last sub-bullet it’s restricted to be indicated “joint TCI state”, except this, in other sentences, there is no restriction, can we further discuss this issue? We are fine to keep all the mentioned TCI state for CJT to be “joint TCI state” or remove the word “joint” in the last sentence, at least we think the description should be aligned in the same paragraph, rather than “TCI-states” in some places and “joint TCI state” for the second indicated one, so the blue highlight should be aligned with same form as the yellow highlight.

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| When a UE is configured by higher layer parameter *cjtSchemePDSCH* and *dl-OrJointTCI-StateList* and is indicated with two TCI-States applied for PDSCH reception and reports [support for two joint TCI states for PDSCH-CJT]:- if the UE is configured with *cjtSchemeA*, the UE assumes that PDSCH DM-RS port(s) are QCLed with the DL RSs of both indicated TCI-States with respect to QCL-TypeA. - if the UE is configured with *cjtSchemeB*, the UE assumes that PDSCH DM-RS port(s) are QCLed with the DL RSs of both indicated TCI-States with respect to QCL-TypeA except for QCL parameters {Doppler shift, Doppler spread} of the second indicated TCI state. |

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| Mod | Add TP 1.5 per request from NEC |
| vivo | TP 1.5: Suggest to change “TCI-State” to “*TCI-State*”, “TCI-States” to “*TCI-States*”.TP 2.1: Clarification is also needed for virtual PHR. For a CC, if the single PHR is based on reference PUSCH transmission, the first TCI state should be used to calculate the virtual PHR for the CC for both S-DCI based STxMP and M-DCI based STxMP. Thus, we propose the following highlighted in canyon change:**Text Proposal 2.1 for M-DCI based STxMP**7.7.1 Type 1 PH report-------------------------------------------Unchanged parts are omitted------------------------------------------For active UL BWP$b$ of carrier $f$ of serving cell $c, i$f a UE is not provided *twoPHRMode*, and is provided- two SRS resource sets in *srs-ResourceSetToAddModList* or *srs-ResourceSetToAddModListDCI-0-2* with usage set to 'codebook' or 'nonCodebook', - *dl-OrJointTCI-StateList* or *TCI-UL-State* and is indicated a first *TCI-State* or *TCI-UL-State* and a second *TCI-State* or *TCI-UL-State*, - is not provided *coresetPoolIndex* or is provided *coresetPoolIndex* with a value of 0 for first CORESETs on active DL BWPs of serving cells, - is provided *coresetPoolIndex* with a value of 1 for second CORESETs on active DL BWPs of the serving cells, and- *sTx-2Panel*the UE provides one Type 1 power headroom report for the actual PUSCH transmission associated with *coresetPoolIndex* value 0 when there are two actual PUSCH transmissions associated with different *coresetPoolIndex* valuesoverlap in time. If UE provides a Type 1 power headroom report and a first configured maximum output power for a reference PUSCH transmission, the Type 1 power headroom report is for a reference PUSCH transmission associated with the first *TCI-State* or *TCI-UL-State*.-------------------------------------------Unchanged parts are omitted------------------------------------------**Text Proposal 2.1 for S-DCI based STxMP**7.7.1 Type 1 PH report-------------------------------------------Unchanged parts are omitted------------------------------------------For active UL BWP$b$ of carrier $f$ of serving cell $c, i$f a UE is not provided *twoPHRMode*, and is provided- two SRS resource sets in *srs-ResourceSetToAddModList* or *srs-ResourceSetToAddModListDCI-0-2* with usage set to 'codebook' or 'nonCodebook',- *dl-OrJointTCI-StateList* or *TCI-UL-State* and is indicated a first *TCI-State* or *TCI-UL-State* and a second *TCI-State* or *TCI-UL-State*, and- *multipanelScheme*the UE provides one Type 1 power headroom report and one configured maximum output power associated with the first *TCI-State* or *TCI-UL-State* for an actual PUSCH transmission using a spatial domain filter corresponding to the first *TCI-State* or *TCI-UL-State* and using a spatial domain filter corresponding to the second *TCI-State* or *TCI-UL-State.* If UE provides a Type 1 power headroom report and a first configured maximum output power for a reference PUSCH transmission, the Type 1 power headroom report is for a reference PUSCH transmission associated with the first *TCI-State* or *TCI-UL-State*.-------------------------------------------Unchanged parts are omitted------------------------------------------ |
| Mod | Remove TP 2.1 (single PHR), more discussion seems necessary |
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1. References

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| # | Source | Title | Tdoc |
| 1 | Samsung | Discussions on cell-specific BFR under the Rel-18 unified TCI framework (eUTCI) | R1-2404092 |
| 2 | Samsung | Draft CR on BFD RS set determination for cell-specific BFR under the Rel-18 unified TCI framework | R1-2404093 |
| 3 | Samsung | Draft CR on BFD RS set determination for cell-specific BFR under the Rel-18 unified TCI framework | R1-2404094 |
| 4 | Samsung | Discussion on twoPHRmode for single-DCI based STx2P | R1-2404097 |
| 5 | vivo | Discussion on M-DCI based PUSCH+PUSCH STxMP | R1-2404158 |
| 6 | vivo | Draft CR on M-DCI based PUSCH+PUSCH STxMP | R1-2404159 |
| 7 | ZTE | Draft CR on beam collision between PDSCH with offset less than a threshold and PDCCH in S-DCI based MTRP | R1-2404252 |
| 8 | ZTE | Draft CR on beam collision between PDSCH with offset less than a threshold and PDCCH in M-DCI based MTRP | R1-2404253 |
| 9 | ZTE | Draft CR on implicit BFD-RS determination for S-DCI based MTRP | R1-2404254 |
| 10 | CATT | Correction on RRC parameters for NR Rel-18 MIMO in TS38.214 | R1-2404368 |
| 11 | CATT | Draft CR on configuration of TCI states for SRS | R1-2404370 |
| 12 | Xiaomi | Draft CR on default beam for AP CSI-RS in M-DCI based MTRP scenario with Rel-18 unified TCI state framework | R1-2404600 |
| 13 | NEC | Draft CR on indicated TCI state in TS38.214 | R1-2404673 |
| 14 | Nokia | Maintenance on NR MIMO Evolution for Downlink and Uplink | R1-2404917 |
| 15 | Docomo | Draft CR on beam application timing for mDCI mTRP for Rel-18 TCI framework | R1-2405021 |
| 16 | Docomo | Remaining issues on power control for M-TRP operation in NR MIMO Evolution for Downlink and Uplink | R1-2405022 |

1. Appendix

**Text Proposal 2.1 for M-DCI based STxMP**

Adopt the following text proposal to TS 38.213 V18.2.0 Section 7.7.1:

* Reason for change: For multi-DCI based STx2P, if two PUSCH transmissions associated with two different coresetPoolIndex values overlapped to each other in time domain, the UE behavior on how to provide a PHR for the actual PUSCH transmission is not specified
* Summary of change: For multi-DCI based STx2P, if two PUSCH transmissions associated with two different coresetPoolIndex values overlapped to each other in time domain, the UE provides a PHR for the actual PUSCH transmission associated with coresetPoolIndex value 0
* Consequences if not approved: For multi-DCI based STx2P, if two PUSCH transmissions associated with two different coresetPoolIndex values overlapped to each other in time domain, the UE behavior on how to provide a PHR for the actual PUSCH transmission is not clear

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| 7.7.1 Type 1 PH report-------------------------------------------Unchanged parts are omitted------------------------------------------For active UL BWP$b$ of carrier $f$ of serving cell $c, i$f a UE is not provided *twoPHRMode*, and is provided- two SRS resource sets in *srs-ResourceSetToAddModList* or *srs-ResourceSetToAddModListDCI-0-2* with usage set to 'codebook' or 'nonCodebook', - *dl-OrJointTCI-StateList* or *TCI-UL-State* and is indicated a first *TCI-State* or *TCI-UL-State* and a second *TCI-State* or *TCI-UL-State*, - is not provided *coresetPoolIndex* or is provided *coresetPoolIndex* with a value of 0 for first CORESETs on active DL BWPs of serving cells, - is provided *coresetPoolIndex* with a value of 1 for second CORESETs on active DL BWPs of the serving cells, and- *sTx-2Panel*the UE provides one Type 1 power headroom report for the actual PUSCH transmission associated with *coresetPoolIndex* value 0 when there are two actual PUSCH transmissions associated with different *coresetPoolIndex* valuesoverlap in time.-------------------------------------------Unchanged parts are omitted------------------------------------------ |

**Text Proposal 2.1 for S-DCI based STxMP**

Adopt the following text proposal to TS 38.213 V18.2.0 Section 7.7.1:

* Reason for change: For single-DCI based STx2P, if an actual PUSCH transmission associated with both first and second indicated TCI states, the UE behavior on how to provide a PHR for the actual PUSCH transmission is not specified.
* Summary of change: For single-DCI based STx2P, if an actual PUSCH transmission associated with both first and second indicated TCI states, the UE provides a PHR for the actual PUSCH transmission based on the first indicated TCI state.
* Consequences if not approved: For single-DCI based STx2P, if an actual PUSCH transmission associated with both first and second indicated TCI states, the UE behavior on how to provide a PHR for the actual PUSCH transmission is not clear.

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| 7.7.1 Type 1 PH report-------------------------------------------Unchanged parts are omitted------------------------------------------For active UL BWP$b$ of carrier $f$ of serving cell $c, i$f a UE is not provided *twoPHRMode*, and is provided- two SRS resource sets in *srs-ResourceSetToAddModList* or *srs-ResourceSetToAddModListDCI-0-2* with usage set to 'codebook' or 'nonCodebook',- *dl-OrJointTCI-StateList* or *TCI-UL-State* and is indicated a first *TCI-State* or *TCI-UL-State* and a second *TCI-State* or *TCI-UL-State*, and- *multipanelScheme*the UE provides one Type 1 power headroom report and one configured maximum output power associated with the first *TCI-State* or *TCI-UL-State* for an actual PUSCH transmission using a spatial domain filter corresponding to the first *TCI-State* or *TCI-UL-State* and using a spatial domain filter corresponding to the second *TCI-State* or *TCI-UL-State.*-------------------------------------------Unchanged parts are omitted------------------------------------------ |