**3GPP TSG RAN WG1 #114** **R1-230xxxx**

**Toulouse, France, August 21st – 25th, 2023**

**Agenda item:** 9.17

**Source:** Samsung

**Title:** Summary of email discussions [114-R18-38.213-NR\_MIMO\_evo\_DL\_UL]

**Document for:** Discussion and decision

# Introduction

The purpose of this document is to collect inputs/comments on the draft CR for TS 38.213 [draftCR\_38213 MIMO](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_114/Inbox/drafts/9.17%28Other%29/%5B38.213%20draft%20CRs%5D/NR_MIMO_evo_DL_UL/R1-230xxxx%20draftCR_38213%20MIMO.docx) on the introduction of MIMO Evolution for Downlink and Uplink. If a comment on a particular aspect has been made by another company, please do not repeat it until, if needed, after a response.

The first checkpoint is on September 5, UTC 13:00.

# First Round Discussion

Please provide your comments on the draft CR for TS 38.213 [draftCR\_38213 MIMO](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_114/Inbox/drafts/9.17%28Other%29/%5B38.213%20draft%20CRs%5D/NR_MIMO_evo_DL_UL/R1-230xxxx%20draftCR_38213%20MIMO.docx).

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| Company | Comments |
| MediaTek (eUTCI) | Thanks for your great effort on the draft CR. Please find our comments bellow.**10.1 UE procedure for determining physical downlink control channel assignment**Comment: According to RAN1 agreement for M-DCI case, since PUSCH transmission scheduled by PDCCH would follow similar behavior as PDSCH, we think it is better to capture them in the same paragraph. Thus, we suggest the following change:**Agreement (RAN1#111)**On unified TCI framework extension for M-DCI based MTRP, the UE shall apply the indicated joint/UL TCI state specific to a *coresetPoolIndex* value to PUSCH transmission scheduled/activated by PDCCH (including DG-PUSCH and Type2 CG-PUSCH) on a CORESET that is associated with the same *coresetPoolIndex* value.

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| If the UE is provided *dl-OrJointTCI-StateList* and- is not provided *coresetPoolIndex* or is provided *coresetPoolIndex* with a value of 0 for first CORESETs on an active DL BWP of a serving cell,- is provided *coresetPoolIndex* with a value of 1 for second CORESETs on the active DL BWP of the serving cells, and- is provided *followUnifiedTCI-State* for the first and second CORESETs, that do not include a CORESET with index 0 and are associated only with USS sets and/or Type3-PDCCH CSS sets, or with CSS sets other than Type3-PDCCH CSS sets,the UE assumes that DM-RS antenna ports for PDCCH receptions in the first and second CORESETs, and DM-RS antenna ports for PDSCH receptions scheduled by DCI formats provided by PDCCH receptions in the first and second CORESETs, are quasi co-located with the reference signals provided by indicated *TCI-State* specific to the first and second CORESETs, respectively; andthe UE transmits PUSCH scheduled by DCI formats provided by PDCCH receptions in the first and second CORESETs using a spatial domain filter corresponding to *TCI-State* or *TCI-UL-State* specific to the first and second CORESETs, respectively.  |

**9.2.2 PUCCH Formats for UCI transmission**Comment* It is a bit confusing to add “of the PUCCH resource” after “the TCI state” since they are “unified” TCI states provided to all channels/signals instead of dedicated to the PUCCH resource. Thus, we suggest to remove it.
* Re the new sub-bullet “if *multipanelSfnScheme* is provided for the PUCCH resource”, it is not correct. Even *multipanelSfnScheme* is provided for a PUCCH resource, STxMP is applied only when *apply-IndicatedTCIState* = ‘both’. Thus, we think the new sub-bullet can be removed, the corresponding behavior is already reflected in the sub-bullet when *apply-IndicatedTCIState* = ‘both’.

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| A spatial setting for a PUCCH transmission by a UE using a PUCCH resource is provided by- an indicated *TCI-State* or *TCI-UL-State*, if provided, as described in [6, TS 38.214];- *PUCCH-SpatialRelationInfo* if the UE is configured with a single value for *pucch-SpatialRelationInfoId*; - as described in [11, TS 38.321], if the UE is provided multiple values for *PUCCH-SpatialRelationInfo*. The UE applies corresponding actions in [11, TS 38.321] and a corresponding setting for a spatial domain filter to transmit PUCCH in the first slot that is after slot $k+3⋅N\_{slot}^{subframe,μ}$ where $k$ is the slot where the UE would transmit a PUCCH with HARQ-ACK information with ACK value corresponding to a PDSCH reception providing the *PUCCH-SpatialRelationInfo*, each slot consists of $N\_{symb}^{slot}$ symbols as defined in [4, TS 38.211],and $μ$ is the SCS configuration for the PUCCH- If *PUCCH-SpatialRelationInfo* or the indicated *TCI-UL-State* provides *ssb-Index*, the UE transmits the PUCCH using a same spatial domain filter as for a reception of a SS/PBCH block with index provided by *ssb-Index* for a same serving cell or, if *servingCellId* is provided, for a serving cell indicated by *servingCellId* - else if *PUCCH-SpatialRelationInfo* or the indicated *TCI-UL-State* provides *csi-RS-Index*, or the indicated *TCI-State* provides *csi-rs* configured with *qcl-Type* set to 'typeD', the UE transmits the PUCCH using a same spatial domain filter as for a reception of a CSI-RS with resource index provided by *csi-RS-Index* or csi-rs for a same serving cell or, if *servingCellId* or *cell* is provided, for a serving cell indicated by *servingCellId* or *cell*- else *PUCCH-SpatialRelationInfo* or the indicated *TCI-UL-State* provides *srs*, the UE transmits the PUCCH using a same spatial domain filter as for a transmission of an SRS with resource index provided by *resource* for a same serving cell and/or active UL BWP or, if *servingCellId* and/or *uplinkBWP* are provided, for a serving cell indicated by *servingCellId* and/or for an UL BWP indicated by *uplinkBWP*- an indicated *apply-IndicatedTCIState*, if provided- if *apply-IndicatedTCIState* = ‘first’, the UE transmits a PUCCH using a spatial domain filter corresponding to a first *TCI-State* or *TCI-UL-State* - if *apply-IndicatedTCIState* = ‘second’, the UE transmits a PUCCH using a spatial domain filter corresponding to second *TCI-State* or *TCI-UL-State* - if *apply-IndicatedTCIState* = ‘both’, the UE transmits a PUCCH using respective first and second spatial domain filters corresponding to the first and the second *TCI-State* or *TCI-UL-State* If the UE- is not provided *coresetPoolIndex* or is provided *coresetPoolIndex* with a value of 0 for first CORESETs on an active DL BWP of a serving cell, and- is provided *coresetPoolIndex* with a value of 1 for second CORESETs on the active DL BWP of the serving cells,the first and second *TCI-State* or *TCI-UL-State* are specific to the first and second CORESETs, respectively.-  |

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| QC(2TAs, STxMP) | **Comment 1**: Section 8.2: The following conditions of the RAN1 agreement is not captured. That is, this new QCL rule is applicable only if the PDCCH order is transmitted from a TRP associated with additional PCI. In other words, if the PDCCH order is transmitted from the serving PCI (irrespective of whether PRACH is toward serving PCI or additional PCI based on cell indicator field in the PDCCH order), the legacy rule of the PCell (UE may assume that the PDCCH that includes the DCI format 1\_0 and the PDCCH order have same DM-RS antenna port quasi co-location properties) is still applied.**Agreement**For inter-cell multi-DCI based multi-TRP operation with two TAGs configured in Spcell, when the PDCCH order is transmitted from a TRP associated with additionalPCI, PDCCH RAR and PDSCH RAR of a CFRA are both QCLed with the CORESET associated with the Type I CSS set**Comment 2**: Section 9.2.2: The following added text seems not accurate since applying both indicated TCI states to a PUCCH resource is not a function of *multipanelSfnScheme*. Instead, it depends on *apply-IndicatedTCIState*. The configuration *multipanelSfnScheme* (per PUCCH-Config) determines “how” to apply both TCI states (if not configured, in TDM manner; if configured, in SFN manner)“- if *multipanelSfnScheme* is provided for the PUCCH resource, the UE transmits a PUCCH using respective first and second spatial domain filters corresponding to first and second *TCI-State* or *TCI-UL-State* of the PUCCH resource”**Comment 3**: Section 9.2.6: Similarly, the following added text may not be accurate since this would be the case only if *apply-IndicatedTCIState=both* for the PUCCH resource.“- if the UE is provided *multipanelSfnScheme* for the PUCCH resource, a repetition of the PUCCH transmission uses first and second spatial domain filters corresponding to first and second *TCI-State* or *TCI-UL-State* of the PUCCH resource”  |
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