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

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

**Agenda item: 9.17**

**Source: Nokia, Nokia Shanghai Bell**

**Title: Summary of email discussion on NR\_MIMO enhancements on uTCI\_STxMP\_DMRS\_SRS\_8Tx\_2TA**

**Document for: Discussion and Decision**

# 1 Introduction

This thread will discuss the draft CR to 38.214 for NR MIMO: uTCI, STxMP, DMRS, SRS, 8TX, 2TA

First checkpoint for this discussion: **September 5, 6:00am UTC!**

# 2 Discussion – first round

The comments in this section are based on version 0 of the the draft CR available in the **Post RAN1#114 discussion.**

### 2.1 uTCI

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| Company | Comments | Editor reply/Notes |
| Samsung | Comment 1: Based on the following agreement made in RAN1#114, we would like to suggest the following text updates for the configuration of the [TCI selection field].**Agreement**Support joint configuration of the presence of “TCI states selection” field for DCI format 1\_1 and DCI format 1\_2 in the same DL BWP

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| - When the UE is configured with *tciSelection-PresentInDCI* jointly for both DCI formats 1\_1 and 1\_2 in the same DL BWP, and when the UE receives a DCI format 1\_1/1\_2 that schedules or activates PDSCH reception, the UE shall determine the indicated joint/DL TCI state(s) for the PDSCH reception according to the following: |

Comment 2: for aperiodic CSI-RS reception in both S-DCI and M-DCI, we do not think the texts “If the UE reports its capability of [two default beams for S-DCI based MTRP] in frequency range 2, the UE uses both indicated joint/DL TCI states to buffer the received signal before a threshold.” are needed. To our understanding, (1) the note in the corresponding agreement is only for clarification purpose, (2) similar UE assumptions were in Rel-15/16, but were not captured in the specifications, (3) “buffer” is unclear. Hence, we suggest the following modifications for both SDCI and MDCI.

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| -if the UE is in frequency range 1, or the UE reports its capability of [two default beams for S-DCI based MTRP] in frequency range 2, the UE shall apply the first or the second indicated joint/DL TCI state to the aperiodic CSI-RS according to the higher layer configuration(s) provided to the aperiodic CSI-RS resource or to the aperiodic CSI-RS resource set. ~~If the UE reports its capability of [two default beams for S-DCI based MTRP] in frequency range 2, the UE uses both indicated joint/DL TCI states to buffer the received signal before a threshold.~~ |

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| -if the UE is in frequency range 1, or the UE reports its capability of [default beam per *coresetPoolIndex* for M-DCI based MTRP] in frequency range 2, the UE shall apply the first or the second indicated joint/DL TCI state to the aperiodic CSI-RS according to the higher layer configuration(s) provided to the aperiodic CSI-RS resource or aperiodic CSI-RS resource set. ~~If the UE reports its capability of [default beam per coresetPoolIndex for M-DCI based MTRP] in frequency range 2, the UE uses both indicated joint/DL TCI states to buffer the received signal before a threshold.~~ |

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### 2.2 STxMP

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| Company | Comments | Editor reply/Notes |
|  | Thank you, Mihai, for the great efforts. Please see some initial comments from our side:**Comment 1**: For all cases where two SRS resource sets can be configured (including Rel-17 single-DCI based TDM scheme, Rel-18 single-DCI based STxMP SDM/SFN schemes, and Rel-18 multi-DCI based STxMP PUSCH+PUSCH), it is already agreed that the two SRS resource sets have the same number of SRS resources. This condition is currently captured for all cases above except for Rel-18 multi-DCI based STxMP PUSCH+PUSCH. Hence, we suggest the following change in Section 6.1, which in addition to addressing this, also makes the description more clear (and removes some redundancy as well).~~When~~ If a UE - is configured with two SRS resource sets ~~are configured~~ in *srs-ResourceSetToAddModList* or *srs-ResourceSetToAddModListDCI-0-2* with higher layer parameter *usage* in *SRS-ResourceSet* set to 'codebook' or 'nonCodebook' and - is configured with the higher layer parameter *enableSTx2PofmDCI* ~~is configured~~*-* is configured with *PDCCH-Config* that contains two different values of *coresetPoolIndex* in *ControlResourceSet* for the active BWP of a serving cell, the UE- ~~and PDCCHs that~~ can be scheduled/configured to transmit two fully/partially overlapping PUSCHs in time domain and fully/partially/non-overlapping in frequency domain, where the two PUSCHs- are associated with ~~to different~~ *~~ControlResourceSets~~* ~~having~~ different values of *coresetPoolIndex*~~.~~, and- ~~Two fully/partially overlapping PUSCH transmissions~~ can be dynamically scheduled by UL grant(s) in DCI(s) and/or transmission(s) corresponding to configured grant(s) Type 1 or Type 2. *-* is not expected to be configured with different number of SRS resources in the two SRS resource sets.*-* the DCI codepoint SRS Resource Set Indicator is not present.**Comment 2**: Section 6.1.1.1 / 6.1.1.2: The following condition for SFN, should be captured under the bullet that is only specific to SFN (When codepoint “10” of *SRS Resource Set* *indicator* is indicated …) since this condition is not applicable to sTRP (e.g., when codepoint 00 or 01 are indicated).- maximum number of layers is up to 2.**Comment 3**: Section 6.2.3.1: The following (newly) added texts seem to belong to 38.212, and our understanding is that the corresponding agreements are already captured by the editor of 38.212 in the draft spec:When the higher layer parameter *multipanelScheme* is set to ‘sdmscheme’ and two SRS resource sets are configured in *srs-ResourceSetToAddModList* or *srs-ResourceSetToAddModListDCI-0-2* with higher layer parameter *usage* in *SRS-ResourceSet* set to 'codebook'/’nonCodebook’ and the higher layer parameter *maxNrofPorts* in *PTRS-UplinkConfig* is set to *n1*, the association between UL PT-RS port(s) and DM-RS port(s) is signalled by *PTRS-DMRS association* field(s) in DCI format 0\_1 and DCI format 0\_2 according to Table 7.3.1.1.2-25 described in Clause 7.3.1.1.2 [TS 38.212].… When the number of UL PT-RS port(s) is one, the association between UL PT-RS port(s) and DM-RS port(s) is signalled by *PTRS-DMRS association* field(s) in DCI format 0\_1 and DCI format 0\_2 according to Table 7.3.1.1.2-25 described in Clause 7.3.1.1.2 of [5, TS 38.212]. When the number of UL PT-RS port(s) is two, the association between UL PT-RS port(s) and DM-RS port(s) is signalled by *PTRS-DMRS association* field(s) in DCI format 0\_1 and DCI format 0\_2 according to Table 7.3.1.1.2-26 described in Clause 7.3.1.1.2 of [5, TS 38.212].When the higher layer parameter *multipanelScheme* is set to ‘SFNscheme’ and two SRS resource sets are configured in *srs-ResourceSetToAddModList* or *srs-ResourceSetToAddModListDCI-0-2* with higher layer parameter *usage* in *SRS-ResourceSet* set to 'codebook'/’nonCodebook’ and the higher layer parameter *maxNrofPorts* in *PTRS-UplinkConfig* is set to *n1*, the association between UL PT-RS port(s) and DM-RS port(s) is signalled by *PTRS-DMRS association* field(s) in DCI format 0\_1 and DCI format 0\_2 according to Table 7.3.1.1.2-25 described in Clause 7.3.1.1.2 of [5, TS 38.212].**Comment 4**: Section 6.1: We suggest the following change to capture the agreement copied below:**Agreement**When multi-DCI based STxMP PUSCH+PUSCH is configured, the existing rules for resolving overlapping PUSCH for the cases of one PUSCH overlapping with another PUSCH in time in one serving cell specified in legacy specifications ~~at least for CG+DG overlap, CG+CG overlap, CG+PUSCH with SP-CSI overlap, or PUSCH with SP-CSI + PUSCH with SP-CSI overlap~~ are performed separately for each coresetPoolIndex value. A UE is not expected to be scheduled by a PDCCH ending in symbol $i$ to transmit a PUSCH on a given serving cell overlapping in time with a transmission occasion, where the UE is allowed to transmit a PUSCH with configured grant according to [10, TS38.321], starting in a symbol $j$ on the same serving cell if the end of symbol $i$ is not at least $N\_{2}$ symbols before the beginning of symbol $j$, if - the UE is not provided *prioLowDG-HighCG* or *prioHighDG-LowCG*, or the UE is provided *prioLowDG-HighCG* or *prioHighDG-LowCG* and the two PUSCHs have the same priority index as described in Clause 9 of [6, TS 38.213]~~.~~, and- the UE is not provided *enableSTx2PofmDCI*, or is provided *enableSTx2PofmDCI* and the two PUSCHs are associated with the same *coresetPoolIndex* value.The value $N\_{2}$ in symbols is determined according to the UE processing capability defined in Clause 6.4, and $N\_{2} $and the symbol duration are based on the minimum of the subcarrier spacing corresponding to the PUSCH with configured grant and the subcarrier spacing of the PDCCH scheduling the PUSCH.  |  |
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### 2.3 DM-RS

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### 2.4 SRS

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### 2.5 8TX

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### 2.6 2TA

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| Company | Comments | Editor reply/Notes |
| Samsung | **Comment 1:**The agreement made in RAN1#114 says: “when the PDCCH order is transmitted from a TRP associated with additionalPCI”, we prefer to use wording that is aligned with the agreement as follows:“when receiving a PDSCH scheduled with RA-RNTI in response to a random access procedure triggered by a PDCCH order which triggers contention-free random access procedure for the SpCell [10, TS 38.321], and if the ~~CORESET~~ TCI state used for the PDCCH order transmission is ~~not~~ associated with ~~the serving~~ additional PCI different from the serving PCI, ~~cell physical cell ID~~ **Comment 2:**We prefer to leave the QCL of PDCCH RAR for 38.213, as it is already described there for other use cases of the PDCCH order.“when receiving a PDSCH scheduled with RA-RNTI in response to a random access procedure triggered by a PDCCH order which triggers contention-free random access procedure for the SpCell [10, TS 38.321], and if the CORESET used for the PDCCH order transmission is not associated with the serving cell physical cell ID, the UE may assume that ~~the DM-RS port of the PDCCH that includes the DCI format 1\_0 and~~ the DM-RS ports of the received PDSCH are quasi co-located with the DM-RS antenna port associated with PDCCH receptions in the CORESET for Type1-PDCCH CSS set with respect to Doppler shift, Doppler spread, average delay, delay spread, and spatial RX parameters when applicable.” |  |
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