**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   |  | | --- | | - 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.   |  | | --- | | -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.~~ |  |  | | --- | | -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 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 on the same serving cell if the end of symbol is not at least symbols before the beginning of symbol , 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 in symbols is determined according to the UE processing capability defined in Clause 6.4, and 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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