3GPP TSG RAN WG1 #104-e R1-210xxxx

e-Meeting, January 25th – February 5th, 2021

Source: Moderator (OPPO)

Title: Discussions on Issue MT.12

Agenda Item: 7.2.6

Document for: Discussion and Decision

# Introduction

A list of editorial TPs will be discussed in this document.

TP#1

Based on the current UE feature group 16-2b-1b, support of the new DMRS port entry {0, 2, 3} is a UE capability for single-DCI based SDM scheme. Consequently, gNB can indicate UE DMRS port entry {0, 2, 3} only if UE supports the feature group 16-2b-1b. ZTE (R1-2100281) proposed that it is not necessary to reiterate it in physical layer specification, i.e. 38.212 and thus they suggest removing the redundant description in the bracket as shown in the following TP1 for 38.212.

## **Round#1 discussion**

Based on the proposal by ZTE (R1-2100281), here is the initial proposal for TP#1

**Proposal: Adopt the following TP for 38.212.**

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| **7.3.1.2.2 Format 1\_1**\*\*\* Unchanged text is omitted \*\*\*- Antenna port(s) – 4, 5, or 6 bits as defined by Tables 7.3.1.2.2-1/2/3/4 and Tables 7.3.1.2.2-1A/2A/3A/4A, where the number of CDM groups without data of values 1, 2, and 3 refers to CDM groups {0}, {0,1}, and {0, 1,2} respectively. The antenna ports  shall be determined according to the ordering of DMRS port(s) given by Tables 7.3.1.2.2-1/2/3/4 or Tables 7.3.1.2.2-1A/2A/3A/4A. When a UE receives an activation command that maps at least one codepoint of DCI field '*Transmission Configuration Indication*' to two TCI states, the UE shall use Table 7.3.1.2.2-1A/2A/3A/4A; otherwise, it shall use Tables 7.3.1.2.2-1/2/3/4. The UE can receive an entry with DMRS ports equals to 1000, 1002, 1003 when two TCI states are indicated in a codepoint of DCI field '*Transmission Configuration Indication*'.\*\*\* Unchanged text is omitted \*\*\* |

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TP#2

There is an agreement about default TCI states of PDSCH of mTRP and it is captured in 38.214 g20 version. However, the highlighted part marked in underline as below is missed in 38.214 g40 version.

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| **Agreement**The default TCI-states for PDSCH transmission of scheme 3 or scheme 4 are determined as follows:* When the time offset between the DCI and **the 1st PDSCH transmission occasion** is less than the threshold, the two default TCI-states are applied to PDSCH transmission occasions, respectively. The mapping between default TCI states and PDSCH transmission occasions follows the mapping specified for indicated TCI states in Section 5.1.2.1 in TS 38.214.
* The default TCI states are based on the activated TCI states in the slot with the first PDSCH transmission occasion
* Note: Whether to support this feature or not is subject to UE capability FG 16-2b-0.
 |

Thus ZTE (R1-2100281) provided TP to correct that.

## **Round#1 discussion**

Based on the proposal by ZTE (R1-2100281), here is the initial proposal for TP#2

**Proposal: Adopt the following TP for 38.214.**

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| **5.1.5 Antenna ports quasi co-location**\*\*\* Unchanged text is omitted \*\*\*Independent of the configuration of *tci-PresentInDCI* and *tci-PresentDCI-1-2* in RRC connected mode, if the offset between the reception of the DL DCI and the first occasion of the corresponding PDSCH is less than the threshold *timeDurationForQCL* and at least one configured TCI state for the serving cell of scheduled PDSCH contains *qcl-Type* set to 'typeD', - the UE may assume that the DM-RS ports of PDSCH of a serving cell are quasi co-located with the RS(s) with respect to the QCL parameter(s) used for PDCCH quasi co-location indication of 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 by the UE. In this case, if the *qcl-Type* is set to 'typeD' of the PDSCH DM-RS is different from that of the PDCCH DM-RS with which they overlap in at least one symbol, the UE is expected to prioritize the reception of PDCCH associated with that CORESET. This also applies to the intra-band CA case (when PDSCH and the CORESET are in different component carriers). \*\*\* Unchanged text is omitted \*\*\* |

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TP#3

For scheme 4 of S-DCI mTRP, the RV offset is defined between PDSCH occasions from two TRPs, and one of the candidate values {0, 1, 2, 3} is configured by RRC signaling. ZTE (R1-2100281) proposed that in the title of Table 5.1.2.1-3 in the current 38.214, the condition description of ‘when *sequenceOffsetforRV* is present’ is unnecessary and causes misunderstanding because the RV offset is always configured for scheme 4 as defined in the 38.331. Thus, it is proposed to remove that condition description.

## **Round#1 discussion**

Based on the proposal by ZTE (R1-2100281), here is the initial proposal for TP#3

**Proposal: Adopt the following TP for 38.214.**

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| **5.1.2.1 Resource allocation in time domain**\*\*\* Unchanged text is omitted \*\*\*The UE may expect that each PDSCH transmission occasion is limited to two transmission layers. For all PDSCH transmission occasions associated with the first TCI state, the redundancy version to be applied is derived according to Table 5.1.2.1-2, where $n$ is counted only considering PDSCH transmission occasions associated with the first TCI state. The redundancy version for PDSCH transmission occasions associated with the second TCI state is derived according to Table 5.1.2.1-3, where additional shifting operation for each redundancy version $rv\_{s} $is configured by higher layer parameter *sequenceOffsetforRV* and $n$ is counted only considering PDSCH transmission occasions associated with the second TCI state. Table 5.1.2.1-3: Applied redundancy version for the second TCI state

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| *rvid* indicated by the DCI scheduling the PDSCH | *rvid* to be applied to *n*th transmission occasion with second TCI state |
| *n* mod 4 = 0 | *n* mod 4 = 1 | *n* mod 4 = 2 | *n* mod 4 = 3 |
| $$0$$ | $$(0+ rv\_{s}) mod 4$$ | $$(2+ rv\_{s}) mod 4$$ | $$(3+ rv\_{s}) mod 4$$ | $$(1+ rv\_{s}) mod 4$$ |
| $$2$$ | $$(2+ rv\_{s}) mod 4$$ | $$(3+ rv\_{s}) mod 4$$ | $$(1+ rv\_{s}) mod 4$$ | $$(0+ rv\_{s}) mod 4$$ |
| $$3$$ | $$(3+ rv\_{s}) mod 4$$ | $$(1+ rv\_{s}) mod 4$$ | $$(0+ rv\_{s}) mod 4$$ | $$(2+ rv\_{s}) mod 4$$ |
| $$1$$ | $$(1+ rv\_{s}) mod 4$$ | $$(0+ rv\_{s}) mod 4$$ | $$(2+ rv\_{s}) mod 4$$ | $$(3+ rv\_{s}) mod 4$$ |

\*\*\* Unchanged text is omitted \*\*\* |

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TP#4

Both Vivo (R1-2100417) and CATT(R1-2100340) proposed that the text description on HARQ-ACK in one slot in Section 9.2.3 of TS 38.213 does not align with the description in 9.2 and thus it could cause confusing. They suggest to make it clear.

## **Round#1 discussion**

Based on the proposal by Vivo (R1-2100417) and CATT(R1-2100340), here is the initial proposal for TP#4

**Proposal: Adopt the following TP for 38.213.**

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| 9.2.3 UE procedure for reporting HARQ-ACKA UE does not expect to transmit more than one PUCCH with HARQ-ACK information in a slot, if the UE is not provided *ackNackFeedbackMode = separate*. \*\*\* Unchanged text is omitted \*\*\* |

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TP#5

LGE (R1-2100617) suggested that the current specification does not cover the case of the default TCI state for mTRP PDSCHs when the UE does not support the capability of default QCL assumption per CORESET Pool.

According to the agreement on default TCI state of M-DCI PDSCH, if UE does not support default QCL assumption per CORESET pool, a default beam is determined in the same way as Rel-15 regardless of CORESET pool. In this case, the default beam can be applied to multiple PDSCHs since two PDSCHs scheduled by different TRPs can be overlapped in time domain. For example, if time offset between DCI 1 and PDSCH 1 scheduled by DCI 1 is less than timeDurationForQCL, and PDSCH 1 and PDSCH 2, scheduled by TRP 1 and TRP 2, respectively, are overlapped in time domain, default beam should be applied to not only PDSCH 1 but also PDSCH 2. However, this behavior is unclear in current specification because it does not consider time domain overlapped multiple PDSCHs.

LGE proposed TP to correct that.

## **Round#1 discussion**

Based on the proposal by LGE (R1-2100617), here is the initial proposal for TP#5

**Proposal: Adopt the following TP for 38.214.**

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| 5.1.5 Antenna ports quasi co-location\*\*\* Unchanged text is omitted \*\*\*Independent of the configuration of *tci-PresentInDCI* and *tci-PresentForDCI-Format1-2-r16* in RRC connected mode, if the offset between the reception of the DL DCI and the corresponding PDSCH is less than the threshold *timeDurationForQCL* and at least one configured TCI state for the serving cell of scheduled PDSCH contains the 'QCL-TypeD', - the UE may assume that the DM-RS ports of PDSCH or fully/partially overlapping PDSCHs in the time domain of a serving cell are quasi co-located with the RS(s) with respect to the QCL parameter(s) used for PDCCH quasi co-location indication of 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 by the UE. In this case, if the 'QCL-TypeD' of the PDSCH DM-RS is different from that of the PDCCH DM-RS with which they overlap in at least one symbol, the UE is expected to prioritize the reception of PDCCH associated with that CORESET. This also applies to the intra-band CA case (when PDSCH and the CORESET are in different component carriers). \*\*\* Unchanged text is omitted \*\*\* |

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TP#6

CATT (R1-2100340) proposed TP to make the following **three** editorial corrections for TS 38.214.

1. **The first correction** is to align terminology in the description of Scheme 4: in current spec, both “transmission occasion” and “transmission” are used to term the repetition in scheme 4. It is suggested to align the terminology to “transmission occasion”.
2. **The second correction** is to clarify understanding on text description in section 5.1 of 38.214 to avoid confusion. As discussed in R1-2100340, Regarding the UE procedure for receiving multiple PDCCHs scheduling fully/partially/non-overlapped PDSCHs in time and frequency domain, the following description can be found in clause 5.1 of 38.214:

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| If a UE is configured by higher layer parameter *PDCCH-Config* that contains two different values of *coresetPoolIndex* in *ControlResourceSet*, the UE may expect to receive multiple PDCCHs scheduling fully/partially/non-overlapped PDSCHs in time and frequency domain. The UE may expect the reception of full/partially-overlapped PDSCHs in time only when PDCCHs that schedule two PDSCHs are associated to different *ControlResourceSets* having different values of *coresetPoolIndex*. For a *ControlResourceSet* without *coresetPoolIndex*, the UE may assume that the *ControlResourceSet* is assigned with *coresetPoolIndex* as 0. When the UE is scheduled with full/partially/non-overlapped PDSCHs in time and frequency domain, the full scheduling information for receiving a PDSCH is indicated and carried only by the corresponding PDCCH, the UE is expected to be scheduled with the same active BWP and the same SCS. When the UE is scheduled with full/partially-overlapped PDSCHs in time and frequency domain, the UE can be scheduled with at most two codewords simultaneously. When PDCCHs that schedule two PDSCHs are associated to different *ControlResourceSets* having different values of *coresetPoolIndex,* the following operations are allowed: |

The highlighted sentence seems to have the following two different interpretation:

* Interpretation 1: The UE may expect the reception of full/partially-overlapped PDSCHs in time**,** only when PDCCHs that schedule two PDSCHs are associated to different *ControlResourceSets* having different values of *CORESETPoolIndex*.
* Interpretation 2:The UE may expect the reception of full/partially-overlapped PDSCHs in timeonly**,** when PDCCHs that schedule two PDSCHs are associated to different *ControlResourceSets* having different values of *CORESETPoolIndex*.

Apparently, Interpretation 1 is our common understanding and thus CATT proposed to update the text to eliminate the potential confusion and wrong interpretation.

1. **The third suggested correction** is regarding the table of RV values applied to the PDSCH of URLLC scheme 4. In current spec, for scheme 4, the redundancy version applied to multiple transmission occasions associated with the first TCI state is derived from the table 5.1.2.1-2, which was defined for slot aggregation transmission in Rel-15 when using the higher layer parameter pdsch\_AggregationFatcor to indicate the repetition number of PDSCH. However, the description of the table is not appropriate for URLLC scheme 4 since the title of that table is “Table 5.1.2.1-2: Applied redundancy version when pdsch-AggregationFactor is present”. That may lead to a misunderstanding on repetition number indication. Therefore, CATT suggested to use a separate table for the illustration for scheme 4 to avoid the confusion.

## **Round#1 discussion**

Based on the proposal by CATT (R1-2100340), here is the initial proposal for TP#6

**Proposal: Adopt the following TP for 38.214.**

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| 5.1 UE procedure for receiving the physical downlink shared channel\*\*\* Unchanged text is omitted \*\*\*If a UE is configured by higher layer parameter *PDCCH-Config* that contains two different values of *coresetPoolIndex* in *ControlResourceSet*, the UE may expect to receive multiple PDCCHs scheduling fully/partially/non-overlapped PDSCHs in time and frequency domain. The UE may expect the reception of full/partially-overlapped PDSCHs in time, only when PDCCHs that schedule two PDSCHs are associated to different *ControlResourceSets* having different values of *coresetPoolIndex*. For a *ControlResourceSet* without *coresetPoolIndex*, the UE may assume that the *ControlResourceSet* is assigned with *coresetPoolIndex* as 0. When the UE is scheduled with full/partially/non-overlapped PDSCHs in time and frequency domain, the full scheduling information for receiving a PDSCH is indicated and carried only by the corresponding PDCCH, the UE is expected to be scheduled with the same active BWP and the same SCS. When the UE is scheduled with full/partially-overlapped PDSCHs in time and frequency domain, the UE can be scheduled with at most two codewords simultaneously. When PDCCHs that schedule two PDSCHs are associated to different *ControlResourceSets* having different values of *coresetPoolIndex,* the following operations are allowed: \*\*\* Unchanged text is omitted \*\*\*5.1.2.1 Resource allocation in time domain\*\*\* Unchanged text is omitted \*\*\*When a UE configured by the higher layer parameter *PDSCH-config* that indicates at least one entry contains *repetitionNumber* in *PDSCH-TimeDomainResourceAllocation*, - If two TCI states are indicated by the DCI field 'Transmission Configuration Indication' together with the DCI field 'Time domain resource assignment' indicating an entry which contains *repetitionNumber* in *PDSCH-TimeDomainResourceAllocation* and DM-RS port(s) within one CDM group in the DCI field 'Antenna Port(s)', the same SLIV is applied for all PDSCH transmission occasions across the *repetitionNumber* consecutive slots, the first TCI state is applied to the first PDSCH transmission occasion and resource allocation in time domain for the first PDSCH transmission occasion follows Clause 5.1.2.1.  When the value indicated by *repetitionNumber* in *PDSCH-TimeDomainResourceAllocation* equals to two, the second TCI state is applied to the second PDSCH transmission occasion. When the value indicated by *repetitionNumber* in *PDSCH-TimeDomainResourceAllocation* is larger than two, the UE may be further configured to enable *cyclicMapping* or *sequenticalMapping* in *tciMapping*. - When *cyclicMapping* is enabled, the first and second TCI states are applied to the first and second PDSCH transmission occasions, respectively, and the same TCI mapping pattern continues to the remaining PDSCH transmission occasions. - When *sequenticalMapping* is enabled, first TCI state is applied to the first and second PDSCH transmission occasions, and the second TCI state is applied to the third and fourth PDSCH transmission occasions, and the same TCI mapping pattern continues to the remaining PDSCH transmission occasions. The UE may expect that each PDSCH transmission occasion is limited to two transmission layers. For all PDSCH transmission occasions associated with the first TCI state, the redundancy version to be applied is derived according to Table 5.1.2.1-3, where $n$ is counted only considering PDSCH transmission occasions associated with the first TCI state. The redundancy version for PDSCH transmission occasions associated with the second TCI state is derived according to Table 5.1.2.1-4, where additional shifting operation for each redundancy version $rv\_{s} $is configured by higher layer parameter *sequenceOffsetforRV-r16* and $n$ is counted only considering PDSCH transmission occasions associated with the second TCI state. Table 5.1.2.1-3: Applied redundancy version when *RepetitionNumber-r16* is present

|  |  |
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| *rvid* indicated by the DCI scheduling the PDSCH | *rvid* to be applied to *n*th transmission occasion with first TCI state |
| *n* mod 4 = 0 | *n* mod 4 = 1 | *n* mod 4 = 2 | *n* mod 4 = 3 |
| 0 | 0 | 2 | 3 | 1 |
| 2 | 2 | 3 | 1 | 0 |
| 3 | 3 | 1 | 0 | 2 |
| 1 | 1 | 0 | 2 | 3 |

Table 5.1.2.1-4: Applied redundancy version for the second TCI state when *sequenceOffsetforRV-r16* is present

|  |  |
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| *rvid* indicated by the DCI scheduling the PDSCH | *rvid* to be applied to *n*th transmission occasion with second TCI state |
| *n* mod 4 = 0 | *n* mod 4 = 1 | *n* mod 4 = 2 | *n* mod 4 = 3 |
| $$0$$ | $$(0+ rv\_{s}) mod 4$$ | $$(2+ rv\_{s}) mod 4$$ | $$(3+ rv\_{s}) mod 4$$ | $$(1+ rv\_{s}) mod 4$$ |
| $$2$$ | $$(2+ rv\_{s}) mod 4$$ | $$(3+ rv\_{s}) mod 4$$ | $$(1+ rv\_{s}) mod 4$$ | $$(0+ rv\_{s}) mod 4$$ |
| $$3$$ | $$(3+ rv\_{s}) mod 4$$ | $$(1+ rv\_{s}) mod 4$$ | $$(0+ rv\_{s}) mod 4$$ | $$(2+ rv\_{s}) mod 4$$ |
| $$1$$ | $$(1+ rv\_{s}) mod 4$$ | $$(0+ rv\_{s}) mod 4$$ | $$(2+ rv\_{s}) mod 4$$ | $$(3+ rv\_{s}) mod 4$$ |

\*\*\* Unchanged text is omitted \*\*\* |

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TP#7

Ericsson (R1-2101691) suggested that there exists ambiguity in the text description (Section 5.1.5 of 38.214) of conditions for the UE to apply default TCI state for single-DCI based mTRP PDSCH. The ambiguity is whether the TCI codepoint refers to the TCI codepoint mapped to TCI field in one DCI or the TCI codepoints activated by MAC CE activation command. Particularly, that could cause problem due to DCI format 1\_2 because only the first S activated codepoints are applied to DCI format 1\_2.

It is proposed to change the wording to clarify that the “TCI codepoint” in the condition of “at least one TCI codepoint indicates two TCI states” means the TCI codepoint activated by the MAC CE activation command and remove the ambiguity.

## **Round#1 discussion**

Based on the proposal by Ericsson (R1-2101691), here is the initial proposal for TP#7

**Proposal: Adopt the following TP for 38.214.**

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| 5.1.5 Antenna ports quasi co-location\*\*\* Unchanged text is omitted \*\*\*- If a UE is configured with *enableTwoDefaultTCIStates-r16*, and at least one TCI codepoint activated by the activation command in 6.1.3.24 of [10, TS38.321] indicates two TCI states, the UE may assume that the DM-RS ports of PDSCH or PDSCH transmission occasions of a serving cell are quasi co-located with the RS(s) with respect to the QCL parameter(s) associated with the TCI states corresponding to the lowest codepoint among the TCI codepoints activated by the activation command in 6.1.3.24 of [10, TS38.321] containing two different TCI states. When the UE is configured by higher layer parameter *repetitionScheme-r16* set to '*TDMSchemeA*' or is configured with higher layer parameter *repetitionNumber-r16*, the mapping of the TCI states to PDSCH transmission occasions is determined according to clause 5.1.2.1 by replacing the indicated TCI states with the TCI states corresponding to the lowest codepoint among the TCI codepoints activated by the activation command in 6.1.3.24 of [10, TS38.321] containing two different TCI states based on the activated TCI states in the slot with the first PDSCH transmission occasion.\*\*\* Unchanged text is omitted \*\*\* |

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TP#8

Intel (R1-2100634) proposed CR for Section 5.1.2.3 of 38.214 to clarify that when counting even or odd PRGs for scheme FDMSchemeA or FDMSchemeB, the PRGs are numbered continuously in increasing order with the first PRG index equal to 0. For 'fdmSchemeA' and 'fdmSchemeB', the PRGs are assigned to TCI states depending on even or odd index of PRG. However, the indexing of PRGs including index of the first PRG is not defined in TS 38.214. Therefore, Intel proposed to clarify that PRGs are numbered continuously in increasing order with the first PRG index equal to 0, similar to subband indexing defined in Section 5.2.3 of TS 38.214.

## **Round#1 discussion**

Based on the proposal by Ericsson (R1-2101691), here is the initial proposal for TP#7

**Proposal: Adopt the following TP for 38.214.**

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| 5.1.2.3 Physical resource block (PRB) bundling\*\*\* Unchanged text is omitted \*\*\*For a UE configured by the higher layer parameter *RepetitionScheme-r16* set to '*FDMSchemeA' or* '*FDMSchemeB', and* when the UE is indicated with two TCI states in a codepoint of the DCI field *'Transmission Configuration Indication* and DM-RS port(s) within one CDM group in the DCI field "*Antenna Port(s)*", - If  is determined as "wideband", the first $\left⌈\frac{n\_{PRB}}{2}\right⌉$ PRBs are assigned to the first TCI state and the remaining $\left⌊\frac{n\_{PRB}}{2}\right⌋$ PRBs are assigned to the second TCI state, where $n\_{PRB} $is the total number of allocated PRBs for the UE. - If  is determined as one of the values among {2, 4}, even PRGs within the allocated frequency domain resources are assigned to the first TCI state and odd PRGs within the allocated frequency domain resources are assigned to the second TCI state, wherein the PRGs are numbered continuously in increasing order with the first PRG index equal to 0. - The UE is not expected to receive more than two PDSCH transmission layers for each PDSCH transmission occasion.\*\*\* Unchanged text is omitted \*\*\* |

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