**3GPP TSG RAN WG1 #118 R1-240yyyy**

**Maastricht, NL, August 19th – 23rd, 2024**

**Agenda Item: 7**

**Source: Moderator (Google)**

**Title: Moderator summary on receiving Msg4 and a common CORESET**

**Document for: Discussion and decision**

1. **Introduction**

This contribution is to collect and summarize companies views on one contribution [1] in RAN1#118. In [1], two changes are brought out by the proponent, where Change 1 is related to beam indication for receiving Msg4 and Change 2 is related to beam indication for receiving a common CORESET (i.e., a CORESET associated with CSS set).

1. **Discussion**

**Change 1**

The below reason is provided by the proponent for the Change 1. The proponent mentions that, based on current spec, when Rel-17 unified TCI is configured, the beam for receiving PDCCH for Msg4 and PDSCH for Msg4 are different. This is deviated from legacy.

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| Based on current TS 38.213 Chapter 10.1, when Rel-17 unified TCI is configured, a PDSCH always follows the indicated TCI state, if the PDSCH is scheduled by a CORESET associated with only USS and/or Type-3 CSS sets or a CORESET associated with CSS sets (other than Type-3 CSS sets) and configured with *followUnifiedTCI-State*. Related texts are quoted below.

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| **TS 38.213 Chapter 10.1**If a UE is provided *TCI-State* in *dl-OrJointTCI-StateList*, a DM-RS antenna port for PDCCH receptionsin a CORESET, other than a CORESET with index 0, associated only with USS sets and/or Type3-PDCCH CSS sets, and a DM-RS antenna port for **PDSCH receptions** scheduled by DCI formats provided by PDCCH receptions in the CORESET are quasi co-located with reference signals provided by **the indicated *TCI-State*** [6, TS 38.214].If a UE is provided *followUnifiedTCI-State* for a CORESET, other than a CORESET with index 0, associated at least with CSS sets other than Type3-PDCCH CSS sets, and if *followUnifiedTCI-State* is set as enabled, a DM-RS antenna port for PDCCH receptions in the CORESET and a DM-RS antenna port for **PDSCH receptions** scheduled by DCI formats provided by PDCCH receptions in the CORESET are quasi co-located with reference signals provided by **the indicated *TCI-State***.  |

 This behavior also applies when UE receives PDSCH for Msg4, since in current TS 38.213 Chapter 8.4, there is no description on how to receive PDSCH for Msg4 when Rel-17 unified TCI is configured. Then, based on current specification, UE uses the indicated TCI state to receive PDSCH for Msg4, even UE uses SSB beam for receiving the scheduling PDCCH. This is incorrect UE behavior and deviated from legacy.  |

Hence, [1] proposes to make the following change.

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| 8.4 PDSCH with UE contention resolution identity< Unchanged parts are omitted >When detecting a DCI format in response to a PUSCH transmission scheduled by a RAR UL grant, as described in [11, TS 38.321], or corresponding PUSCH retransmission scheduled by a DCI format 0\_0 with CRC scrambled by a TC-RNTI provided in the corresponding RAR message [11, TS 38.321], the UE may assume the PDCCH carrying the DCI format has the same DM-RS antenna port quasi co-location properties, as described in [6, TS 38.214], as for a SS/PBCH block the UE used for PRACH association, as described in clause 8.1, regardless of whether or not the UE is provided TCI-State for the CORESET where the UE receives the PDCCH with the DCI format. If the DCI format schedules a PDSCH, the UE may assume the PDSCH has the same DM-RS antenna port quasi co-location properties, as described in [6, TS 38.214], as for a SS/PBCH block the UE used for PRACH association, as described in clause 8.1, regardless of whether or not the UE is provided TCI-State from *dl-OrJointTCI-StateList* for the CORESET where the UE receives the PDCCH with the DCI format. < Unchanged parts are omitted > |

**Moderator notes**

During online session, some companies thought this change is needed or this issue should be resolved. On the other hand, there were also a number of companies with different views. One company mentioned that the below quoted texts in TS 38.214 has already covered the issue. However, the proponent responded that the quoted texts were introduced based on Rel-15 TCI framework, instead of Rel-17 TCI framework. In addition, in Rel-15, the beam indication for receiving PDSCH is all described in TS 38.214. Nonetheless, in Rel-17, beam indication for receiving PDSCH is also described in TS 38.213 (Chapter 10.1, see above). Different behaviour in different specifications results in the confusion.

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| **TS 38.214**When receiving PDSCH in response to a PUSCH transmission scheduled by a RAR UL grant or corresponding PUSCH retransmission, or when receiving PDSCH in response to a PUSCH for Type-2 random access procedure, or a PUSCH scheduled by a fallback RAR UL grant or corresponding PUSCH retransmission, the UE may assume that the DM-RS port of PDSCH is quasi co-located with the SS/PBCH block the UE selected for RACH association and transmission with respect to Doppler shift, Doppler spread, average delay, delay spread, spatial RX parameters when applicable. |

**Discussion 1-1: Please provide your views on beam indication for receiving PDSCH for Msg4, when Rel-17 unified TCI is configured**

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| Company | Comment  |
| Qualcomm | In our understanding, there are two cases that a UE receives Msg4, i.e., UE contention resolution ID MAC CE, as described in Section 5.1.5 of TS 38.321: 1) initial access and 2) on-demand SI request. For the initial access, the UE is in idle mode and thus the UE cannot be configured with unified TCI state when monitoring Msg4. In this case, the above text in TS 38.214 would be sufficient. For the on-demand SI request, however, the UE can be in connected mode and, thus, it could be configured with unified TCI state when monitoring Msg4. In this case, we think some clarification like those suggested in [1] would be needed.  |
| Samsung | We consider that beam indication for PDSCH reception for Msg4 should be followed in TS 38.214. Although the operation of the Rel-17 TCI framework is also described in TS38.213, this is a general description. TS38.214 deals with details depending on the Msg4 PDSCH reception situation and is already resolving concerns raised by CR. Therefore, how to apply the beam direction Msg4 PDSCH is clear and there will be no significant issues. |
| MediaTek | Current spec in 214 should be applied to any PDSCH reception for Msg4, including the case when a UE is configured with Rel-17 TCI framework. The sentence “regardless of whether or not the UE is provided TCI-State for the CORESET where the UE receives the PDCCH with the DCI format” covers the cases (1) the UE is provided TCI-State for the CORESET by MAC-CE in Rel-15 TCI framework (2) the UE is provided TCI-State for the CORESET by following the indicated TCI state in Rel-17 unified TCI framework. |
| Nokia | Agree with QC that during initial access UE does not have indicated TCI state, but there may be cases with ambiguity on which TCI state to apply for msg4; e.g. handover. The above text from 38.214 describes the default assumptions for msg4 without distinguishing whether UE is configured Rel-17 unified TCI or not. In our view, msg4 must follow these assumptions in all cases but we agree that the excerpt from 10.1 in TS38.213 may override this assumption, while 8.4 does not define it for msg4 PDSCH. Thus, the behavior could be interpreted differently depending on which specification ‘overrides’ the other.  |
| vivo | In our understanding, the QCL assumption for Msg4/B specified in 38.214 is applied for all cases.We’re fine to have a conclusion on this if needed. |
| Docomo | We think the QCL assumption for Msg4/B specified in 38.214 is applied for all cases. |
| Huawei, Hisilicon | Same view as MTK. We are also open to have a conclusion that the current spec covers both cases (legacy TCI and unified TCI) |

**Discussion 1-2: Do you think Spec change is needed. If yes, how? (e.g., go with Change 1 or other ways)**

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| Company | Comment  |
| Qualcomm | In our view, we can focus on the Msg4 PDSCH TCI state overriding, because the PDCCH TCI state overriding is already clearly described in the current specification:When detecting a DCI format in response to a PUSCH transmission scheduled by a RAR UL grant, as described in [11, TS 38.321], or corresponding PUSCH retransmission scheduled by a DCI format 0\_0 with CRC scrambled by a TC-RNTI provided in the corresponding RAR message [11, TS 38.321], the UE may assume the PDCCH carrying the DCI format has the same DM-RS antenna port quasi co-location properties, as described in [6, TS 38.214], as for a SS/PBCH block the UE used for PRACH association, as described in clause 8.1, regardless of whether or not the UE is provided TCI-State for the CORESET where the UE receives the PDCCH with the DCI format. For a PDSCH reception scheduled by the DCI format, the UE may assume the PDSCH has the same DM-RS antenna port quasi co-location properties, as described in [6, TS 38.214], as for a SS/PBCH block the UE used for PRACH association, as described in clause 8.1, regardless of whether or not the UE is configured with *dl-OrJointTCI-StateList* and is indicated with one or two TCI state(s). |
| Samsung | We don’t think the spec. changes are needed. |
| MediaTek | Current spec in 214 of PDSCH reception for Msg4 doesn’t preclude the case when a UE is configured with Rel-17 unified TCI framework. Therefore, spec change is not necessary.  |
| Nokia | If RAN1 agrees that 38.214 has default assumptions for all cases, then no spec change is needed. We are also ok with proposed change in 38.213 so that application of default assumptions for msg4 PDSCH TCI state from 38.214 is reinforced.  |
| vivo | A conclusion might be enough as we commented for previous question. |
| Docomo | We are fine with either TP or conclusion. |

**Change 2**

The below reason is provided by the proponent for the Change 2. The proponent proposes to remove a redundant condition.

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| **Change 2**Since there is only one value (“enabled”) for *followUnifiedTCI-State*, if configured, there is no need to have the following two conditions at the same time: * “If a UE is provided *followUnifiedTCI-State*”,
* “If *followUnifiedTCI-State* is set as enabled”.
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Hence, [1] proposes to make the following change.

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| 10.1 UE procedure for determining physical downlink control channel assignment < Unchanged parts are omitted >If a UE is provided *followUnifiedTCI-State* for a CORESET, other than a CORESET with index 0, associated at least with CSS sets other than Type3-PDCCH CSS sets, a DM-RS antenna port for PDCCH receptions in the CORESET and a DM-RS antenna port for PDSCH receptions scheduled by DCI formats provided by PDCCH receptions in the CORESET are quasi co-located with reference signals provided by the indicated *TCI-State*.< Unchanged parts are omitted > |

**Discussion 2: Please provide your views on Change 2, e.g., whether you agree with this change, or whether you have any suggestion/comment.**

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| Company | Comment  |
| Nokia | Agree with motivation but the change is not essential – not absolutely needed. |
| vivo | Fine with the editorial update which can be achieved by asking editor to update it in next version. |
| Docomo | Fine with the TP for better readability. |
| Huawei, Hisilicon | Fine with the TP. |
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1. **Summary**

TBD

1. **Conclusion**

TBD

**Reference**

1. R1-2407117 Correction on receiving Msg4 and a CORESET associated with CSS set, Google