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

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

**Source: Moderator (NTT DOCOMO)**

**Title: FL summary on Rel-18 MIMO DMRS**

**Agenda item: 8.1**

**Document for: Discussion and Decision**

# Introduction

This document contains summary of proposals for DMRS.

* **Critical (C)**: this includes high-priority issue (essential, pending issues, broken spec components) or editorial change that either enhances the clarity of the specs or corrects mistakes in the specs.
* **Non-essential (N)**: this includes all other purposes such as spec optimization and low-priority issues.
* **Editorial (E)**: this includes editorial issues that will be handled as editorial CRs.

# Discussion

The following is the summary of issues. Draft CRs with assessment = C/E will be discussed in online.

If you have any comments, please input in “Companies’ view” for each issue.

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| # | Issue | Assessment | Companies’ view (please provide your view on the assessment of each issue) |
| 1 | The port indexes for PDSCH DMRS type 2 are not correctly captured (R1-2406550).  FL: The issue is valid. | E | Editorial (E): NEC, Docomo, Samsung, OPPO, vivo, Lenovo, ZTE, Xiaomi, Fujitsu, CATT,New H3C, Huawei, HiSilicon, Spreadtrum  Non-essential (N): |
| 2 | Correct RRC parameters and UE capability name.  (R1-2406804).  FL: Since the tdoc includes many TPs, TPs related to DMRS are extracted in Section 3. (See Section 3)  FL: The issue is valid. | E | Editorial (E): Ericsson, Docomo, Samsung, OPPO, vivo, Lenovo, ZTE,Xiaomi, Fujitsu, CATT,New H3C, Huawei, HiSilicon, Spreadtrum  Non-essential (N): |
| 3 | PTRS-DMRS association for 8Tx is specified in 7.3.1.1.2 in TS38.212 using *maxRank*. However, the case using *maxMIMO-Layers* is missing (R1-2407178).  FL: The issue is valid. | C | Critical (C): Ericsson, Docomo, Samsung, OPPO, vivo, Lenovo, ZTE (Editorial), Fujitsu (Editorial), CATT,New H3C, Huawei, HiSilicon (Need wording refinement, attached in section 4) , Spreadtrum  Non-essential (N): |
| 4 | In the agreed CR (R1-2405746) in RAN1#117, “and non-codebook based” was inadvertently deleted from Table 6.2.3.1-3A in TS38.214 (R1-2407181).  FL: The issue is valid. | C | Critical (C): Ericsson, Docomo, Samsung, OPPO(Editorial), vivo, Lenovo, ZTE (Editorial), Fujitsu (Editorial), CATT,New H3C, Huawei, HiSilicon (Editorial) , Spreadtrum  Non-essential (N): |

# Text proposals for issue#2 (R1-2406804)

**TPs in R1-2406804 related to DMRS agreements are extracted below.**

**Proposal: Adopt the following TPs for alignment CR of TS 38.214.**

* Reason for change: TS 38.214 introduced brackets around various open parameter and capability names. These parameter names have now been set.
* Summary of change: Removes brackets and corrects parameter and capability names.
* Consequences if not approved: Unclear spec

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| 5.3 UE PDSCH processing procedure time  If the first uplink symbol of the PUCCH which carries the HARQ-ACK information, as defined by the assigned HARQ-ACK timing *K1* and Koffset, if configured, and the PUCCH resource to be used and including the effect of the timing advance, starts no earlier than at symbol *L1*, where *L1* is defined as the next uplink symbol with its CP starting after  after the end of the last symbol of the PDSCH carrying the TB being acknowledged, then the UE shall provide a valid HARQ-ACK message. For a PDSCH with disabled HARQ-ACK feedback,.  *- N1* is based on *µ* of table 5.3-1 and table 5.3-2 for UE processing capability 1 and 2 respectively, where *µ* corresponds to the one of (*µPDCCH*, *µPDSCH*, *µUL*) resulting with the largest *Tproc,1*, where the *µPDCCH* corresponds to the subcarrier spacing of the PDCCH scheduling the PDSCH, the *µPDSCH* corresponds to the subcarrier spacing of the scheduled PDSCH, and *µUL* corresponds to the subcarrier spacing of the uplink channel with which the HARQ-ACK is assumed to be transmitted for PDSCH with or without disabled HARQ-ACK feedback, and κ is defined in clause 4.1 of [4, TS 38.211].  *-* For UE processing capability 2,  *-* if the UE is not indicating *simulDMRS-PDSCH*, the UE is not expected to be simultaneously configured with higher layer parameter *processingType2Enabled* set to 'enable' and higher layer parameter *dmrs-TypeEnh*, and the additional processing delay *d3* is 0.  - if the UE is indicating *simulDMRS-PDSCH*,  *-* if the UE is configured with higher layer parameter *dmrs-TypeEnh,* the additional processing delay *d3* is indicated by *simulDMRS-PDSCH*,  *-* otherwise *d3* =0. |

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| 6.1.3 UE procedure for applying transform precoding on PUSCH  For a PUSCH scheduled by RAR UL grant, or for a PUSCH scheduled by fallbackRAR UL grant, or for a PUSCH scheduled by DCI format 0\_0 with CRC scrambled by TC-RNTI, the UE shall consider the transform precoding either 'enabled' or 'disabled' according to the higher layer configured parameter *msg3-transformPrecoder.*  For a MsgA PUSCH, the UE shall consider the transform precoding either 'enabled' or 'disabled' according to the higher layer configured parameter *msgA-TransformPrecoder.* If higher layer parameter *msgA-TransformPrecoder* is not configured, the UE shall consider the transform precoding either 'enabled' or 'disabled' according to the higher layer configured parameter *msg3-transformPrecoder.*  For PUSCH transmission scheduled by a PDCCH with CRC scrambled by CS-RNTI with NDI=1, C-RNTI, or MCS-C-RNTI or SP-CSI-RNTI:  - If the DCI with the scheduling grant was received with DCI format 0\_0, the UE shall, for this PUSCH transmission, consider the transform precoding either enabled or disabled according to the higher layer configured parameter *msg3-transformPrecoder*.  - If the DCI with the scheduling grant was not received with DCI format 0\_0  - If the DCI with the scheduling grant was received with DCI format 0\_1 or 0\_2 with CRC scrambled by C-RNTI, MCS-RNTI, or CS-RNTI with NDI=1 and if the UE is configured with a higher layer parameter *dynamicTransformPrecoderFieldPresenceDCI-0-1* in *pusch-Config* for DCI format 0\_1 or *dynamicTransformPrecoderFieldPresenceDCI-0-2* in *pusch-Config* for DCI format 0\_2 and the higher layer parameter is set to 'enabled',  - the UE shall, for this PUSCH transmission, consider the transform precoding either enabled or disabled according to the Transform precoder indicator field in the DCI with the scheduling grant.  - For *pusch-TimeDomainAllocationListForMultiPUSCH* in *pusch-Config,* the UE shall, for all PUSCH transmissions, consider the transform precoding either enabled or disabled according to Transform precoder indicator field in the DCI format 0\_1 with the scheduling grant.  - If r*esourceAllocation* in *pusch-Config* for DCI format 0\_1 or *resourceAllocationDCI-0-2* in *pusch-Config* for DCI format 0\_2 is set to *resourceAllocationType0*, or if the resource allocation is set to resource allocation type 0 according to the DCI configuration as described in clauses 7.3.1.1.2 and 7.3.1.1.3 of [6, TS 38.212], or if *dmrs-Type* in *DMRS-UplinkConfig* is set to ‘type 2’ for this PUSCH transmission, the UE does not expect that the Transform precoder indicator field in the DCI with the scheduling grant indicates that transform precoding is enabled.  - If the UE is configured with the higher layer parameter *dmrs-TypeEnh* in *DMRS-UplinkConfig*, and if the scheduling grant indicates that transform precoding is enabled for the scheduled PUSCH transmission, the UE ignores the higher layer parameters *dmrs-TypeEnh* in *DMRS-UplinkConfig*, if configured, for the DM-RS transmission of the scheduled PUSCH transmission.  - Otherwise,  - If the UE is configured with the higher layer parameter *transformPrecoder* in *pusch-Config*, the UE shall, for this PUSCH transmission, consider the transform precoding either enabled or disabled according to this parameter.  - If the UE is not configured with the higher layer parameter *transformPrecoder* in *pusch-Config*, the UE shall, for this PUSCH transmission, consider the transform precoding either enabled or disabled according to the higher layer configured parameter *msg3-transformPrecoder*.  <Unchanged text omitted> |

# Text proposals for issue#3 (Added by Huawei)

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| 7.3.1.1.2 Format 0\_1  DCI format 0\_1 is used for the scheduling of one or multiple PUSCH in one cell, or indicating CG downlink feedback information (CG-DFI) to a UE.  The following information is transmitted by means of the DCI format 0\_1 with CRC scrambled by C-RNTI or CS-RNTI or SP-CSI-RNTI or MCS-C-RNTI:  - Identifier for DCI formats - 1 bit  🡨---------------------------------------------------------Unchanged Text Omitted--------------------------------------------------🡪  - PTRS-DMRS association - number of bits determined as follows  - 0 bit if *PTRS-UplinkConfi*g is not configured in either *dmrs-UplinkForPUSCH-MappingTypeA* or *dmrs-UplinkForPUSCH-MappingTypeB* and transform precoder is disabled, or if transform precoder is enabled, or if *maxRank=1* and *multipanelScheme* is not configured, or if *maxRank=1* and *maxRankSfn=1*, or if *maxRank=1* and *maxRankSdm=1* when two PTRS ports are configured by *maxNrofPortsforSdm*;  - 2 or 4 bits otherwise, where Table 7.3.1.1.2-25/7.3.1.1.2-25A/7.3.1.1.2-25B/7.3.1.1.2-26/7.3.1.1.2-26A are used to indicate the association between PTRS port(s) and DMRS port(s), and the DMRS ports are indicated by the Antenna ports field.  - 2 bits when one PTRS port or two PTRS ports are configured by *maxNrofPorts* in *PTRS-UplinkConfig*, SRS resource set indicator field is absent or SRS resource set indicator field is present and equals "00" or “01”, and *maxRank*<=4 or maxMIMO-Layers<=4, this field indicates the association between PTRS port(s) and DMRS port(s) corresponding to SRS resource indicator field and/or Precoding information and number of layers field according to Tables 7.3.1.1.2-25 and 7.3.1.1.2-26.  - 2 bits when one PTRS port or two PTRS ports are configured by *maxNrofPorts* in *PTRS-UplinkConfig*, the SRS resource set indicator field is present and equals "10" or “11”, *maxRank=*3 or 4or maxMIMO-Layers=3 or 4, and *multipanelScheme* is not configured, this field indicates the association between PTRS port(s) and DMRS port(s) corresponding to SRS resource indicator field and/or Precoding information and number of layers field according to Tables 7.3.1.1.2-25 and 7.3.1.1.2-26.  - 2 bits when one PTRS port or two PTRS ports are configured by *maxNrofPorts* in *PTRS-UplinkConfig*, the SRS resource set indicator field is present and equals "10" or "11", *maxRank=*2or maxMIMO-Layers=2, and *multipanelScheme* is not configured, the MSB of this field indicates the association between PTRS port(s) and DMRS port(s) corresponding to SRS resource indicator and/or Precoding information and number of layers field, and the LSB of this field indicates the association between PTRS port(s) and DMRS port(s) corresponding to Second SRS resource indicator field and/or Second Precoding information field, according to Table 7.3.1.1.2-25A.  - 2 bits when two PTRS ports are configured by *maxNrofPortsforSDM* in *PTRS-UplinkConfig*, the SRS resource set indicator field is present and equals "10" and *multipanelScheme* is configured to *sdmScheme*, the MSB of this field indicates the association between PTRS port 0 and DMRS port(s) corresponding to SRS resource indicator field and/or Precoding information and number of layers field, and the LSB of this field indicates the association between PTRS port 1 and DMRS port(s) corresponding to Second SRS resource indicator field and/or Second Precoding information field, according to Table 7.3.1.1.2-25A.  - 2 bits when one PTRS port is configured by *maxNrofPortsforSDM* in *PTRS-UplinkConfig*, SRS resource set indicator field is present and equals "10" and *multipanelScheme* is configured to *sdmScheme*, this field indicates the association between PTRS port and DMRS ports corresponding to SRS resource indicator field and Second SRS resource indicator field and/or Precoding information and number of layers field and Second Precoding information field according to Table 7.3.1.1.2-25.  - 2 bits when one PTRS port or two PTRS ports are configured by *maxNrofPorts* in *PTRS-UplinkConfig,* SRS resource set indicator field is present and equals "10", *multipanelScheme* is configured to *sfnScheme*, this field indicates the association between PTRS port(s) and DMRS port(s) corresponding to SRS resource indicator field and/or Precoding information and number of layers field according to Tables 7.3.1.1.2-25 and 7.3.1.1.2-26.  - 2 bits when one PTRS port is configured by *maxNrofPorts* in *PTRS-UplinkConfig*, the SRS resource set indicator field is absent, *maxRank>*4or *maxMIMO-Layers>*4, and *multipanelScheme* is not configured, this field indicates the association between PTRS port and DMRS port(s) corresponding to the selected codeword according to Table 7.3.1.1.2-25B, where the selected codeword is the codeword with higher MCS for the initial PUSCH if the MCS indices of the two codewords are different for the initial PUSCH, or codeword 0 otherwise.  - 4 bits when two PTRS ports are configured by *maxNrofPorts* in *PTRS-UplinkConfig*, the SRS resource set indicator field is absent, *maxRank>*4or *maxMIMO-Layers>*4, and *multipanelScheme* is not configured, this field indicates the association between PTRS port(s) and DMRS port(s) corresponding to SRS resource indicator field and/or Precoding information and number of layers field according to Table 7.3.1.1.2-26A.  If "Bandwidth part indicator" field indicates a bandwidth part other than the active bandwidth part and the "PTRS-DMRS association" field is present for the indicated bandwidth part but not present for the active bandwidth part, the UE assumes the "PTRS-DMRS association" field is not present for the indicated bandwidth part.  🡨---------------------------------------------------------Unchanged Text Omitted--------------------------------------------------🡪  **Table 7.3.1.1.2-25: PTRS-DMRS association or Second PTRS-DMRS association for UL PTRS port 0**   |  |  | | --- | --- | | **Value** | **DMRS port** | | 0 | 1st scheduled DMRS port | | 1 | 2nd scheduled DMRS port | | 2 | 3rd scheduled DMRS port | | 3 | 4th scheduled DMRS port |   **Table 7.3.1.1.2-25A: PTRS-DMRS association for UL PTRS port 0 or for the actual UL PT-RS port if *multipanelScheme* is not configured, or PTRS-DMRS association for UL PTRS port 0 and 1 if multipanelScheme is configured to *sdmScheme* and *maxNrofPortsforSDM* is set to 2**   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Value of MSB** | **DMRS port** |  | **Value of LSB** | **DMRS port** | | 0 | 1st scheduled DMRS port corresponding to SRS resource indicator field and/or Precoding information and number of layers field |  | 0 | 1st scheduled DMRS port corresponding to Second SRS resource indicator field and/or Second Precoding information field | | 1 | 2nd scheduled DMRS port corresponding to SRS resource indicator field and/or Precoding information and number of layers field |  | 1 | 2nd scheduled DMRS port corresponding to Second SRS resource indicator field and/or Second Precoding information field |   **Table 7.3.1.1.2-25B: PTRS-DMRS association for UL PTRS port 0, *maxRank>*4or *maxMIMO-Layers>*4**   |  |  | | --- | --- | | **Value** | **DMRS port** | | 0 | 1st scheduled DMRS port corresponding to the selected Codeword | | 1 | 2nd scheduled DMRS port corresponding to the selected Codeword | | 2 | 3rd scheduled DMRS port corresponding to the selected Codeword | | 3 | 4th scheduled DMRS port corresponding to the selected Codeword |   **Table 7.3.1.1.2-26: PTRS-DMRS association or Second PTRS-DMRS association for UL PTRS ports 0 and 1**   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Value of MSB** | **DMRS port** |  | **Value of LSB** | **DMRS port** | | 0 | 1st DMRS port which shares PTRS port 0 |  | 0 | 1st DMRS port which shares PTRS port 1 | | 1 | 2nd DMRS port which shares PTRS port 0 |  | 1 | 2nd DMRS port which shares PTRS port 1 |   **Table 7.3.1.1.2-26A: PTRS-DMRS association for UL PTRS ports 0 and 1, *maxRank>*4or *maxMIMO-Layers>*4**   |  |  |  |  | | --- | --- | --- | --- | | **Value of 2 MSBs** | **DMRS port** | **Value of 2 LSBs** | **DMRS port** | | 0 | 1st DMRS port which shares PTRS port 0 | 0 | 1st DMRS port which shares PTRS port 1 | | 1 | 2nd DMRS port which shares PTRS port 0 | 1 | 2nd DMRS port which shares PTRS port 1 | | 2 | 3rd DMRS port which shares PTRS port 0 | 2 | 3rd DMRS port which shares PTRS port 1 | | 3 | 4th DMRS port which shares PTRS port 0 | 3 | 4th DMRS port which shares PTRS port 1 |   **Table 7.3.1.1.2-27: void** |

# Conclusion

# References

Following draft CRs are proposed for DMRS in AI8.1 (NR\_MIMO\_evo\_DL\_UL-Core).

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| [1] | R1-2406550 | Draft CR on DMRS port index in TS38.211 | NEC |
| [2] | R1-2406804 | Draft CR for 38.214 on editorial corrections | Ericsson |
| [3] | R1-2407178 | Draft CR on PTRS-DMRS Association for 8 Tx UL MIMO | Ericsson |
| [4] | R1-2407181 | Draft CR on PT-RS Power for Non-Codebook Based 8 Tx PUSCH | Ericsson |