**3GPP TSG RAN Meeting #102 RP-23xxxx**

**Edinburgh, Scotland, December 11-15, 2023**

## Status Report to TSG

**Agenda item:** 9.3.1.4

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| --- | --- | --- | --- | --- | --- |
| **WI / SI Name** | NR MIMO evolution for downlink and uplink | | | | |
| included in this status report | Study Item:  No | Core part:  Yes | Performance part:  Yes | | Testing part:  No |
| **Acronym** | NR\_MIMO\_evo\_DL\_UL | | | | |
| **Unique ID** | 940096 | | | | |
| **TSG Tdoc of latest approved WI/SI description (if any)** | RP-223276 | | | | |
| **Target Completion Date**  **(indicate if changed)** | Study Item:  n/a | Core part: 12/2023 | Performance part: 06/2024 | Testing part: n/a | |
| **Overall Completion level** | Study Item:  n/a | Core part:  100% | Performance Part:  25% | Testing part: n/a | |

Note: Overall completion level percentage numbers should use one of the colors below:

* xx%: Normal progress, no RAN plenary action needed
* xx%: Progress behind schedule, may need RAN plenary intervention. If so, SR should clearly define requested action
* xx%: Progress critically behind, RAN plenary shall intervene. SR should define requested action

**Source:**

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| --- | --- | --- |
| **Leading WG** | | RAN1 |
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## 1 Work plan related evaluation

|  |  |
| --- | --- |
| **Do you want to modify the time budget for this WI/SI compared to what was endorsed at the last RAN meeting?** | No |

*If you answered No: Then please remove the Excel file from the zip file of this status report.*

*If you answered Yes: Then please fill out the attached Excel template to request a modification of the time budgets for your WI /SI. The Excel table has to be filled out for all affected RAN WGs and up to the target date of the WI/SI. The basis are the endorsed time budgets of the last RAN meeting. Please highlight all changes of the values.  
 One time unit (TU) corresponds to ~ 2 hours in the meeting.  
 If this status report covers a WI with Core and Performance part, then please have one line for each in the attached Excel table.  
 Note: If no Excel table is attached, then this means no time budget change.*

**Additional explanations/motivations for the time budget changes in the attached Excel table:**

## 2. Detailed progress in RAN WGs since last TSG meeting (for all involved WGs)

NOTE: Agreements and Open issues impacted cross-TSG aspects shall be explicitly highlighted

## 2.1 RAN1

#### 2.1.1 Agreements

**In RAN1#114bis, the following agreements were made.**

Multi-TRP enhancement

**Agreement**

Proposal 4.5 in R1-2310206 is agreed for the editor’s CR

**Agreement**

On unified TCI framework extension, if the scheduling offset between the last symbol of the PDCCH carrying the triggering DCI and the first symbol of AP CSI-RS for BM/CSI is smaller than a threshold for AP CSI-RS reception:

* + If there is other DL signal in the same symbols as the AP CSI-RS, the UE applies the QCL assumption of the other DL signal also when receiving the AP CSI-RS
  + For S-DCI based MTRP operation, if there is a PDSCH applying two indicated TCI states in the same symbols as the AP CSI-RS, the UE applies ~~the first indicated TCI state of the two indicated TCI states when receiving the AP CSI-RS~~ the first or the second indicated joint/DL TCI state to the AP CSI-RS according to the higher layer configuration(s) provided to the AP CSI-RS resource or to the aperiodic CSI-RS resource set.
  + Rel-17 definitions of “other DL signal” specified in TS 38.214 for AP CSI-RS reception in S-DCI based MTRP operations and M-DCI based MTPR operation are retained

**Agreement**

Adopt the following text proposal for TS 38.214 V18.0.0 Section 5.1.2.3, 5.1.3.1, 5.1.3.2, 5.1.6.2, and 5.1.6.3

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| --- |
| 5.1.2.3 Physical resource block (PRB) bundling  <Unchanged part is omitted>  For a UE configured by the higher layer parameter *repetitionScheme* set to 'fdmSchemeA*' or* 'fdmSchemeB*', and* when the UE not configured with *dl-OrJointTCI-StateList* is indicated with two TCI states in a codepoint of the DCI field *'Transmission Configuration Indication'*, or when the UE configured with *dl-OrJointTCI-StateList* and having two indicated TCI-States is determined to apply both indicated TCI-States to PDSCH, and the UE is indicated with DM-RS port(s) within one CDM group in the DCI field '*Antenna Port(s)*',  - If  is determined as "wideband", the first PRBs are assigned to the first TCI state and the remaining PRBs are assigned to the second TCI state, where 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.  For a UE configured by the higher layer parameter *repetitionScheme* set to 'fdmSchemeB*',* andwhen the UE not configured with *dl-OrJointTCI-StateList* is indicated with two TCI states in a codepoint of the DCI field *'Transmission Configuration Indication'*, or when the UE configured with *dl-OrJointTCI-StateList* and having two indicated TCI-States is determined to apply both indicated TCI-States to PDSCH, and the UE is indicated with and DM-RS port(s) within one CDM group in the DCI field '*Antenna Port(s)',* each PDSCH transmission occasion shall follow the Clause 7.3.1 of [4, TS 38.211] with themapping to resource elements determined by the assigned PRBs for corresponding TCI state of the PDSCH transmission occasion, and the UE shall only expect at most two code blocks per PDSCH transmission occasion when a single transmission layer is scheduled and a single code block per PDSCH transmission occasion when two transmission layers are scheduled. For two PDSCH transmission occasions, the redundancy version to be applied is derived according to Table 5.1.2.1-2, where are applied to the first and second TCI state, respectively. |
| 5.1.3.1 Modulation order and target code rate determination  <Unchanged part is omitted>  For a UE configured with the higher layer parameter *repetitionScheme* set to 'fdmSchemeB', and when the UE not configured with *dl-OrJointTCI-StateList* is indicated with two TCI states in a codepoint of the DCI field *'Transmission Configuration Indication'*, or when the UE configured with *dl-OrJointTCI-StateList* and having two indicated TCI-States is determined to apply both indicated TCI-States to PDSCH, and the UE is indicated with and DM-RS port(s) within one CDM group in the DCI field '*Antenna Port(s)*', the determined modulation order of PDSCH transmission occasion associated with the first TCI state is applied to the PDSCH transmission occasion associated with the second TCI state.  <Unchanged part is omitted>  5.1.3.2 Transport block size determination  <Unchanged part is omitted>  For a UE configured with the higher layer parameter *repetitionScheme* set to 'fdmSchemeB', and when the UE not configured with *dl-OrJointTCI-StateList* is indicated with two TCI states in a codepoint of the DCI field *'Transmission Configuration Indication'*, or when the UE configured with *dl-OrJointTCI-StateList* and having two indicated TCI-States is determined to apply both indicated TCI-States to PDSCH, and the UE is indicated with DM-RS port(s) within one CDM group in the DCI field '*Antenna Port(s)*', the TBS determination follows the steps 1-4 with the following modification in step 1: a UE determines the total number of REs allocated for PDSCH () by , where *nPRB* is the total number of allocated PRBs corresponding to the first TCI state, and the determined TBS of PDSCH transmission occasion associated with the first TCI state is also applied to the PDSCH transmission occasion associated with the second TCI state. For a UE configured with the higher layer parameter *repetitionScheme* set to 'tdmSchemeA'and indicated with two TCI states in a codepoint of the DCI field *'Transmission Configuration Indication'* for the UE not configured with *dl-OrJointTCI-StateList* or determined to apply both indicated TCI-States to PDSCH for the UE configured with *dl-OrJointTCI-StateList* and having two indicated TCI-States, and it is indicated with DM-RS port(s) within one CDM group in the DCI field '*Antenna Port(s)*', the TBS determination follows the steps 1-4 with the following modification in step 1: a UE determines the number of REs allocated for PDSCH within a PRB () by , where  is the number of symbols of the PDSCH allocation within the slot corresponding to the first TCI state, and the determined TBS of PDSCH transmission occasion associated with the first TCI state is also applied to the PDSCH transmission occasion associated with the second TCI state.  <Unchanged part is omitted> |
| 5.1.6.2 DM-RS reception procedure  <Unchanged part is omitted>  When a UE is not indicated with a DCI that DCI field '*Time domain resource assignment*' indicating an entry which contains *repetitionNumber* in *PDSCH-TimeDomainResourceAllocation,* the UE is not configured with *sfnSchemePdsch* and it is indicated with two TCI states in a codepoint of the DCI field *'Transmission Configuration Indication'* for the UE not configured with *dl-OrJointTCI-StateList* or determined to apply both indicated TCI-States to PDSCH for the UE configured with *dl-OrJointTCI-StateList* and having two indicated TCI-States, and it is indicated with DM-RS port(s) within two CDM groups in the DCI field '*Antenna Port(s)',*  - the first TCI state corresponds to the CDM group of the first antenna port indicated by the antenna port indication table, and the second TCI state corresponds to the other CDM group.  If a UE is configured with higher layer parameter *dmrs-FD-OCC-DisabledForRank1-PDSCH* and the UE is scheduled with PDSCH with single DM-RS port, the UE may assume that set of orthogonal DM-RS antenna ports from the same CDM group using different set of *w*f(*k*') codes are not associated with the transmission of PDSCH to another UE.  5.1.6.3 PT-RS reception procedure  <Unchanged part is omitted>  When a UE is not indicated with a DCI that DCI field '*Time domain resource assignment*' indicating an entry which contains *repetitionNumber* in *PDSCH-TimeDomainResourceAllocation*, and if the UE is configured with the higher layer parameter *maxNrofPorts* equal to *n2*, the UE is not configured with *sfnSchemePdsch* and if the UE not configured with *dl-OrJointTCI-StateList* is indicated with two TCI states by the codepoints of the DCI field *'Transmission Configuration Indication'* or if the UE configured with *dl-OrJointTCI-StateList* and having two indicated TCI-States is determined to apply both indicated TCI-States to PDSCH, and the UE is indicated with DM-RS port(s) within two CDM groups in the DCI field '*Antenna Port(s)'*, the UE shall receive two PT-RS ports which are associated to the lowest indexed DM-RS port among the DM-RS ports corresponding to the first/second indicated TCI state, respectively.  When a UE configured by the higher layer parameter *repetitionScheme* set to 'fdmSchemeA*'* or 'fdmSchemeB*',* and the UE not configured with *dl-OrJointTCI-StateList* is indicated with two TCI states in a codepoint of the DCI field *'Transmission Configuration Indication'* or the UE configured with *dl-OrJointTCI-StateList* and having two indicated TCI-States is determined to apply both indicated TCI-States to PDSCH, and the UE is indicated with DM-RS port(s) within one CDM group in the DCI field '*Antenna Port(s)*', the UE shall receive a single PT-RS port which is associated with the lowest indexed DM-RS antenna port among the DM-RS antenna ports assigned for the PDSCH, a PT-RS frequency density is determined by the number of PRBs associated to each TCI state, and a PT-RS resource element mapping is associated to the allocated PRBs for each TCI state. |

**Agreement**

Adopt the following text proposal for TS 38.214 V18.0.0 Section 5.1.2.1:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| 5.1.2.1 Resource allocation in time domain  <Unchanged part is omitted>  When a UE is configured by the higher layer parameter *repetitionScheme* set to 'tdmSchemeA*'* and indicated DM-RS port(s) within one CDM group in the DCI field '*Antenna Port(s)'*, the number of PDSCH transmission occasions is derived by the number of TCI states indicated by the DCI field *'Transmission Configuration Indication'* of the scheduling DCI for the UE not configured with *dl-OrJointTCI-StateList*, or by the number of indicated TCI-States that are determined to apply to PDSCH for the UE configured with *dl-OrJointTCI-StateList* and having two indicated TCI-States*.*  - If two TCI states are indicated by the DCI field '*Transmission Configuration Indication*' for a UE not configured with *dl-OrJointTCI-StateList*, or both indicated TCI-States are determined to apply to PDSCH for a UE configured with *dl-OrJointTCI-StateList* and having two indicated TCI-States, the UE is expected to receive two PDSCH transmission occasions, where 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. The second TCI state is applied to the second PDSCH transmission occasion, and the second PDSCH transmission occasion shall have the same number of symbols as the first PDSCH transmission occasion. If the UE is configured by the higher layers with a value in *StartingSymbolOffsetK*, it shall determine that the first symbol of the second PDSCH transmission occasion starts after symbols from the last symbol of the first PDSCH transmission occasion. If the value is not configured via the higher layer parameter *StartingSymbolOffsetK*, = 0 shall be assumed by the UE. The UE is not expected to receive more than two PDSCH transmission layers for each PDSCH transmission occasion. For two PDSCH transmission occasions, the redundancy version to be applied is derived according to Table 5.1.2.1-2, where applied respectively to the first and second TCI state. The UE expects the PDSCH mapping type indicated by DCI field '*Time domain resource assignment*' to be mapping type B, and the indicated PDSCH mapping type is applied to both PDSCH transmission occasions.  - Otherwise, the UE is expected to receive a single PDSCH transmission occasion, and the resource allocation in the time domain follows Clause 5.1.2.1.  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' for a UE not configured with *dl-OrJointTCI-StateList*, or both indicated TCI-States are determined to apply to PDSCH for a UE configured with *dl-OrJointTCI-StateList* and having two indicated TCI-States, 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 5.1.2.1-2, where 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 is configured by higher layer parameter *sequenceOffsetforRV* and 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 when *sequenceOffsetforRV* is present**   |  |  |  |  |  | | --- | --- | --- | --- | --- | | ***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** | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  |   - If one TCI state is indicated by the DCI field 'Transmission Configuration Indication' for a UE not configured with *dl-OrJointTCI-StateList*, or one indicated TCI-State is determined to apply to PDSCH for a UE configured with *dl-OrJointTCI-StateList*, 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 PDSCH transmission occasion follows Clause 5.1.2.1, the same TCI state is applied to all PDSCH transmission occasions. The UE may expect that each PDSCH transmission occasion is limited to two transmission layers. For all PDSCH transmission occasions, the redundancy version to be applied is derived according to Table 5.1.2.1-2, where is counted considering PDSCH transmission occasions.  - Otherwise, the UE is expected to receive a single PDSCH transmission occasion, and the resource allocation in the time domain follows Clause 5.1.2.1.  <Unchanged part is omitted> |

**Agreement**

Adopt the following text proposal for TS 38.214 V18.0.0 Section 5.1:

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| 5.1   UE procedure for receiving the physical downlink shared channel  <Unchanged part is omitted>  When a UE is configured by higher layer parameter *repetitionScheme* set to one of 'fdmSchemeA*'*, 'fdmSchemeB*'*, 'tdmSchemeA*'*, if the UE not configured with *dl-OrJointTCI-StateList* is indicated with two TCI states in a codepoint of the DCI field *'Transmission Configuration Indication'*, or if the UE configured with *dl-OrJointTCI-StateList* and having two indicated TCI-States is determined to apply both indicated TCI-States to PDSCH, and the UE is indicated with DM-RS port(s) within one CDM group in the DCI field '*Antenna Port(s)'*.  -     When ~~two TCI states are indicated in a DCI and~~ the UE is set to 'fdmSchemeA*',* the UE shall receive a single PDSCH transmission occasion of the TB with each TCI state associated to a non-overlapping frequency domain resource allocation as described in Clause 5.1.2.3.  -     When ~~two TCI states are indicated in a DCI and~~ the UE is set to 'fdmSchemeB*'*, the UE shall receive two PDSCH transmission occasions of the same TB with each TCI state associated to a PDSCH transmission occasion which has non-overlapping frequency domain resource allocation with respect to the other PDSCH transmission occasion as described in Clause 5.1.2.3.  -     When ~~two TCI states are indicated in a DCI and~~ the UE is set to 'tdmSchemeA*'*, the UE shall receive two PDSCH transmission occasions of the same TB with each TCI state associated to a PDSCH transmission occasion which has non-overlapping time domain resource allocation with respect to the other PDSCH transmission occasion and both PDSCH transmission occasions shall be received within a given slot as described in Clause 5.1.2.1.  When a UE is configured by the higher layer parameter *repetitionNumber* in *PDSCH-TimeDomainResourceAllocation*, the UE not configured with *dl-OrJointTCI-StateList* may expect to be indicated with one or two TCI states in a codepoint of the DCI field *'Transmission Configuration Indication'* or the UE configured with *dl-OrJointTCI-StateList* may expect to determine one or two indicated TCI-States applied to PDSCH, 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)'*.  -     When two TCI states are indicated in a DCI with '*Transmission Configuration Indication*' field for the UE not configured with *dl-OrJointTCI-StateList*, or when both indicated TCI-States are determined to apply to PDSCH for the UE configured with *dl-OrJointTCI-StateList* and having two indicated TCI-States, the UE may expect to receive multiple slot level PDSCH transmission occasions of the same TB with two TCI states used across multiple PDSCH transmission occasions in the *repetitionNumber* consecutive slots as defined in Clause 5.1.2.1.   1. -     When one TCI state is indicated in a DCI with '*Transmission Configuration Indication*' field for the UE not configured with *dl-OrJointTCI-StateList*, or when one indicated TCI-State is determined to apply to PDSCH for the UE configured with *dl-OrJointTCI-StateList*, the UE may expect to receive multiple slot level PDSCH transmission occasions of the same TB with one TCI state used across multiple PDSCH transmission occasions in the *repetitionNumber* consecutive slots as defined in Clause 5.1.2.1.   When a UE is not indicated with a DCI that DCI field '*Time domain resource assignment*' indicating an entry which contains *repetitionNumber* in *PDSCH-TimeDomainResourceAllocation*, and it is indicated with two TCI states in a codepoint of the DCI field *'Transmission Configuration Indication'* for the UE not configured with *dl-OrJointTCI-StateList*, or it is determined to apply both indicated TCI-States to PDSCH for the UE configured with *dl-OrJointTCI-StateList* and having two indicated TCI-States, and is indicated with DM-RS port(s) within two CDM groups in the DCI field '*Antenna Port(s)'* and it is not configured with higher layer parameter *sfnSchemePdsch*, the UE may expect to receive a single PDSCH where the association between the DM-RS ports and the TCI states are as defined in Clause 5.1.6.2.  When a UE is not indicated with a DCI that DCI field '*Time domain resource assignment*' indicating an entry which contains *repetitionNumber* in *PDSCH-TimeDomainResourceAllocation*, and it is not configured with *dl-OrJointTCI-StateList* and is indicated with one TCI states in a codepoint of the DCI field *'Transmission Configuration Indication'*, or it is configured with *dl-OrJointTCI-StateList* and is determined to apply one indicated TCI-State to PDSCH,the UE procedure for receiving the PDSCH upon detection of a PDCCH follows Clause 5.1.  When a UE is configured with higher layer parameter *sfnSchemePdsch* set to either *'*sfnSchemeA*'* or *'*sfnSchemeB*'* for a DL BWP and  -     if the UE reports its capability of *sfn-SchemeA-DynamicSwitching~~-r17~~* or *sfn-SchemeB-DynamicSwitching~~-r17~~*, the UE not configured with *dl-OrJointTCI-StateList* is indicated with one or two TCI state(s) in a codepoint of the DCI field *'Transmission Configuration Indication'* in DCI format 1\_1/1\_2, or the UE configured with *dl-OrJointTCI-StateList* and having two indicated TCI-States is determined to apply one or two indicated TCI-States to PDSCH  -     otherwise, the UE not configured with *dl-OrJointTCI-StateList* is not expected to be indicated with one TCI state per any of TCI codepoint by MAC CE~~,~~ and the UE is indicated with two TCI states in a codepoint of the DCI field *'Transmission Configuration Indication'* in DCI format 1\_1/1\_2, ~~and~~ or the UE configured with *dl-OrJointTCI-StateList* and having two indicated TCI-States is determined to apply both indicated TCI-States to PDSCH.  the UE procedure for receiving the PDSCH upon detection of a PDCCH follows clause 5.1 and the QCL assumption for the PDSCH as defined in clause 5.1.5.   1. When a UE is configured with both *sfnSchemePdsch* and *sfnSchemePdcch*, the UE shall expect that *sfnSchemePdsch* and *sfnSchemePdcch* are set to the same scheme, either *'*sfnSchemeA*'* or *'*sfnSchemeB*'*. 2. If a UE not configured with *dl-OrJointTCI-StateList* is configured with *sfnSchemePdcch* set to 'sfnSchemeA' for a DL BWP and activated with two TCI states by MAC CE, and the UE does not report its capability of *sfn-SchemeA-PDCCH-only*, the UE is expected to be configured with *sfnSchemePdsch* set to *'sfnSchemeA'* and indicated with two TCI states to be applied to PDSCH in a codepoint of the DCI field *'Transmission Configuration Indication',* if the PDSCH is scheduled by DCI format 1\_1/1\_2. 3. If a UE configured with *dl-OrJointTCI-StateList* and having two indicated TCI-States is configured with *sfnSchemePdcch* set to 'sfnSchemeA' for a DL BWP and signaled by the higher layer parameter [applyIndicatedTCIState] to apply both indicated TCI-States to a PDCCH on a CORESET, and the UE does not report its capability of *sfn-SchemeA-PDCCH-only*, the UE is expected to be configured with *sfnSchemePdsch* set to *'sfnSchemeA'* and both indicated TCI-States are determined to apply to PDSCH, if the PDSCH is scheduled by DCI format 1\_1/1\_2 on the PDCCH. 4. If a UE not configured with *dl-OrJointTCI-StateList* is configured with *sfnSchemePdcch* set to 'sfnSchemeB' for a DL BWP and activated with two TCI states by MAC CE, the UE is expected to be configured with *sfnSchemePdsch* set to *'sfnSchemeB'* and indicated with two TCI states in a codepoint of the DCI field *'Transmission Configuration Indication'',* if the PDSCH is scheduled by DCI format 1\_1/1\_2.   If a UE configured with *dl-OrJointTCI-StateList* and having two indicated TCI-States is configured with *sfnSchemePdcch* set to 'sfnSchemeB' for a DL BWP, and signaled by the higher layer parameter [applyIndicatedTCIState] to apply both indicated TCI-States to a PDCCH on a CORESET, the UE is expected to be configured with *sfnSchemePdsch* set to *'sfnSchemeB'* and both indicated TCI-States are determined to apply to PDSCH*,* if the PDSCH is scheduled by DCI format 1\_1/1\_2 on the PDCCH.  <Unchanged part is omitted> |

**Agreement**

On unified TCI framework extension for M-DCI based MTRP, if the scheduling offset between the last symbol of the PDCCH carrying a scheduling DCI and the first symbol of the scheduled PDSCH is smaller than a threshold:

* If the UE doesn’t support the capability of default beam per *coresetPoolIndex* for M-DCI based MTRP in FR2:
  + The UE shall apply the indicated joint/DL TCI state specific to *coresetPoolIndex* value 0 to the scheduled PDSCH reception
  + The UE doesn’t expect to be scheduled with PDSCH with scheduling offset less than a threshold of the PDSCH if scheduled by a CORESET associated with *coresetPoolIndex* value 1
* Note: If the UE supports the capability of default beam per *coresetPoolIndex* for M-DCI based MTRP in FR2, UE can use both indicated joint/DL TCI states to buffer the received signal before a threshold.

**Agreement**

On unified TCI framework extension for S-DCI based MTRP, if *twoPHRMode* is configured, and two SRS resource sets for CB/NCB and *multipanelScheme* for SDM/SFN are configured:

* If the UE determines that only one Type 1 PHR is based on an actual PUSCH transmission
  + If the actual PUSCH transmission applies only the first indicated joint/UL TCI state, the UE provides the second {power headroom, configured max output power} associated with the second indicated joint/UL TCI state for a reference PUSCH transmission
  + If the actual PUSCH transmission applies only the second indicated joint/UL TCI state, the UE provides the first {power headroom, configured max output power} associated with the first indicated joint/UL TCI state for a reference PUSCH transmission
* If the UE determines that both Type 1 PHRs are based on reference PUSCH transmissions, the UE provides the first {power headroom, configured max output power} associated with the first indicated joint/UL TCI state for a reference PUSCH transmission, and the second {power headroom, configured max output power} associated with the second indicated joint/UL TCI state for another reference PUSCH transmission
* FFS: Whether the configured max output power reported in above cases is per UE or per panel or both
* ~~Down-select one of the following alternatives to be reported along with the power headroom for a reference PUSCH transmission:~~
  + ~~Alt1: Per-panel configured max output power~~
  + ~~Alt2: Per-UE configured max output power~~
  + ~~Alt3: Both per-panel configured max output power and per-UE configured max output power~~
  + ~~Alt4: None~~

**Agreement**

The following working assumption is confirmed

* *“For intra-cell multi-DCI based Multi-TRP operation with two TA enhancement, support the case where a PDCCH order sent by TRPX triggers RACH procedure towards either TRPX or TRPY.”*

Above confirmation does not change power control for the same TRP PDCCH order.

**Agreement**

For inter-cell multi-DCI based Multi-TRP operation with two TA enhancement, 1 bit is supported for indicating active additionalPCI in the PDCCH order

* *the single bit in the PDCCH order indicates if the PRACH triggering is towards servingCell PCI or active additional PCI*

Note: This has no impact on whether common or separate field with cell indication in LTM is used

**Agreement**

*When a UE is configured with both the inter-cell multi-DCI based Multi-TRP operation with two TAs and Rel-18 LTM features,*

* *Alt 1: separate fields are used to indicate additionalPCI (for inter-cell mTRP) and to indicate cell indicator field (for Rel-18 LTM)*

**Conclusion**

There is no consensus to extend 2TA enhancement to BFD/BFR in Rel-18

CSI enhancement

**Agreement**

For the Rel-18 Type-II codebook refinement for CJT mTRP, clarify, in TS 38.214 section 5.2.1.4.1, that if NZP CSI-RS resource for interference measurement is configured, only one resource is configured in the corresponding *NZP-CSI-RS-ResourceSet* for interference measurement

**Agreement**

For the Rel-18 Type-II codebook refinement for CJT mTRP, with respect to L or , the supported Parameter Combinations is enumerated for each NTRP value (up to 5 for Rel-16-based and 8 for Rel-17-based), rather than enumerating across all NTRP values of 1, 2, 3, and 4 (up to 17 for Rel-16-based and 20 for Rel-17-based).

* Note: in TS38.214, this affects Tables 5.2.2.2.8-1, 5.2.2.2.8-3, 5.2.2.2.9-1, and 5.2.2.2.9-3

**Conclusion**:

For the Rel-18 Type-II codebook refinement for CJT mTRP, there is no consensus on the following:

* clarifying, in TS38.214 section 5.2.2.2.8), that the RRC parameter *n1-n2-codebookSubsetRestriction-CJT-r18* is configured for at least one of the NTRP CSI-RS resources if CBSR is configured.
* amending, in TS 38.214 section 5.2.2.2.8, the precoder normalization from the sum to the maximum of squared-magnitude across the NTRP CSI-RS resources
* regarding the condition on reporting/dropping a CSI report, amending, in TS 38.214 section 5.2.2.5.1, that one CSI-RS transmission occasion is interpreted to include “all” (replacing “one”) of CSI-RS resources in the corresponding CSI-RS Resource Set.

**Agreement**

For the Rel-18 Type-II codebook refinement for CJT mTRP, regarding the condition on reporting/dropping a CSI report, capture, in TS 38.214 section 5.2.2.5.1, the following condition: “… after the CSI report (re)configuration, serving cell activation, BWP change, or activation of SP-CSI”

* Further discuss how to reflect cell DTX/DRX as part of the condition under agenda item 8.5

**Agreement**

For the Type-II codebook refinement for high/medium velocities, add, in TS 38.214 section 5.2.2.5.1, that in addition to “in the CSI reference resource”, CQI (and if configured PMI/RI) calculation should assume “in each of the slot(s) where the CQI in the predicted CSI is associated with as defined in sub-clause 5.2.1.4.2”

**Agreement**

For the Type-II codebook refinement for high/medium velocities, clarify, in TS 38.214 section 5.2.1.4.1, that if NZP CSI-RS resource for interference measurement is configured, only one resource is configured in the corresponding *NZP-CSI-RS-ResourceSet* for interference measurement

**Conclusion**:

For the Type-II codebook refinement for high/medium velocities, in case of TDD, there is no consensus on the following:

* regarding the condition on reporting/dropping a CSI report, amending, in TS 38.214 section 5.2.2.5.1, that one CSI-RS transmission occasion is interpreted to include “all” (replacing “one”) of CSI-RS resources in the corresponding CSI-RS Resource Set.

**Agreement**

For the Type-II codebook refinement for high/medium velocities, regarding the condition on reporting/dropping a CSI report, capture, in TS 38.214 section 5.2.2.5.1, the following condition: “…after the CSI report (re)configuration, serving cell activation, BWP change, or activation of SP-CSI”

* Further discuss how to reflect cell DTX/DRX as part of the condition under agenda item 8.5

**Agreement**

For the Rel-18 TRS-based TDCP reporting, add the following in TS 38.215 on TDCP description: “For frequency range 1 and 2, if receiver diversity is in use by the UE, the reported TDCP amplitude value shall not be lower thanthe minimum and no higher than the maximum measured values across the receiver branches.”

* Note: This is based on RAN4 LS R1-2308807

**Agreement**

For the Rel-18 TRS-based TDCP reporting, regarding interference measurement, interference measurement is not supported (hence neither CSI-IM nor NZP CSI-RS resource for interference measurement can be configured)

* Whether/How to capture the above is up to the editor

**Conclusion**:

For the Rel-18 TRS-based TDCP reporting, there is no consensus on the following:

* reverting a previous agreement by specifying the TDCP entry value as “invalid” and a UE behavior to report this entry value when TDCP determination accuracy is low.
* clarifying that UE is not expected to be configured with Y, Dn and/or KTRS value(s), wherein at least two TRS instances separated by Dn symbols/slots are unavailable.
* adding, in TS 38.214 section 5.2.1.2, the following UE behaviour: when , the UE does not expect the CSI-RS Resources of more than one of the CSI-RS Resource Sets are configured as QCL source with respect to ‘typeA’ or ‘typeD’ of any potential PDCCH or PDSCH.

**Agreement**

For the Type-II codebook refinement for high/medium velocities, regarding CPU allocation, remove Y=2/3 (previously agreed) and add the support for OCPU=8 for K=12 for AP-CSIRS

**Agreement**

Adopt the following TP in TS 38.214 section 5.2.2.5 v18.0.0:

* **Reason for change**: Since one NZP CSI-RS for interference measurement and/or one CSI-IM resource can be configured for a CSI-ReportConfig configured with codebookType set to 'typeII-CJT-r18' or 'typeII-CJT-PortSelection-r18' or 'typeII-Doppler-r18' or 'typeII-Doppler-PortSelection-r18', NZP-IMR should also be considered for the UE behaviors in dropping or reporting CSI report for 'typeII-Doppler-r18' or 'typeII-Doppler-PortSelection-r18', just like the legacy behaviors.
* **Summary of change**: Added the case where IMR (NZP CSI-RS for IM and/or CSI-IM) is configured as a condition for CSI reporting/dropping
* **Consequences if not approved**: CSI dropping/reporting behavior is incomplete

|  |
| --- |
| 5.2.2.5 CSI reference resource definition  ------------------------------------------Start of Text Proposal ----------------------------------  <Unchanged text is omitted>  For a *CSI-ReportConfig* configured with *codebookType* set to ‘typeII-Doppler-r18’ or ‘typeII-Doppler-PortSelection-r18’, the UE reports a CSI report only if receiving at least one aperiodic or periodic or semipersistent consecutive CSI-RS transmission occasions for each CSI-RS resource in the corresponding CSI-RS Resource Set for channel measurement and one CSI-RS and/or ~~one~~ CSI-IM resource transmission occasion for the CSI-RS and/or CSI-IM resource in the corresponding Resource Set for interference measurement no later than the CSI reference resource and within the same DRX Active Time, when DRX is configured, and drops the report otherwise. The value of is indicated by UE capability, as defined in clause 5.2.1.6.  < Unchanged parts are omitted >  --------------------------------------- End of Text Proposal ------------------------------------ |

**Agreement**

Adopt the following TP in TS 38.214 section 5.2.2.5.1b v18.0.0:

* **Reason for change**: The clause “transmitted on P antenna ports of CSI-RS resource j” may suggest that PDSCH EPRE is assumed per TRP (rather than across all TRPs – which is the case for CJT) for CQI calculation
* **Summary of change**: Removed “transmitted on P antenna ports of CSI-RS resource j”
* **Consequences if not approved**: PDSCH EPRE assumption for CQI calculation when Rel-18 Type-II CJT codebook is used can be misinterpreted

|  |
| --- |
| ------------------------------------------Start of Text Proposal ----------------------------------  5.2.2.5.1b UE assumptions for CQI/PMI/RI calculation for CJT  <Unchanged text is omitted>   * a UE can assume that the PDSCH signals for layers ~~transmitted on the antenna ports of CSI-RS resource ~~~~j~~ would have the same ratio of EPRE to CSI-RS EPRE for all CSI-RS resources j with j=1,…,N, equal to the *powerControlOffset* of the respective CSI-RS resource.   < Unchanged parts are omitted >  --------------------------------------- End of Text Proposal ------------------------------------ |

**Agreement**

For the Rel-18 TRS-based TDCP reporting, the UE reports a CSI report only if receiving at least one CSI-RS transmission occasion for each CSI-RS resource for KTRS CSI-RS resource sets configured for TDCP reporting no later than CSI reference resource, otherwise drops the report.

* This includes the cases of CSI report (re)configuration, serving cell activation, BWP change
  + FFS (RAN1#115): Whether DRX configuration needs to be included as a case

Reference signal enhancement

**Agreement**

The following TPs in R1-2310278 are agreed for the editor’s CR.

* FL Proposal 2.2A
* FL Proposal 2.2B
* FL Proposal 2.3B

Relevant side information can be found in R1-2310466.

**Agreement**

Introduce a separate UE capability to report the orphan RE capability (i.e. UE can receive PDSCH without the scheduling restriction for FD-OCC length 4 in Rel.18 eType 1 DMRS) for PDSCH with *fdmSchemeA* or *fdmSchemeB*.

**Conclusion**

DCI formats 1\_1/1\_2/0\_1/0\_2 and other DCI formats (except for DCI format 0\_0/1\_0), which are specified as equally applied as at least one of DCI formats 1\_1/1\_2/0\_1/0\_2, can indicate Rel.18 DMRS ports.

**Agreement**

* Clarify in TS 38.214 that for partial-coherent and non-coherent codebook-based 8Tx UL transmission, when the UE is configured with 2 PTRS ports, PUSCH antenna port 1000, 1001, 1004 and 1005 share PTRS port 0, and PUSCH antenna port 1002, 1003, 1006 and 1007 share PTRS port 1.
* Adopt the following TP for TS 38.214.

|  |
| --- |
| 6.2.3.1 UE PT-RS transmission procedure when transform precoding is not enabled  \*\*\* Unchanged parts are omitted \*\*\*  For partial-coherent and non-coherent codebook-based UL transmission, the actual number of UL PT-RS port(s) is determined based on TPMI(s) and/or number of layers which are indicated by '*Precoding information and number of layers'* field(s) in DCI format 0\_1 and DCI format 0\_2 or configured by higher layer parameter *precodingAndNumberOfLayers*:  - if the UE is configured with the higher layer parameter *maxNrofPorts* in *PTRS-UplinkConfig* set to 'n2', the actual UL PT-RS port(s) and the associated transmission layer(s) are derived from indicated TPMI(s) as:  - For PUSCH transmission with 2 or 4 ports, PUSCH antenna port 1000 and 1002 in indicated TPMI(s) share PT-RS port 0, and PUSCH antenna port 1001 and 1003 in indicated TPMI(s) share PT-RS port 1.  - UL PT-RS port 0 is associated with the UL layer 'x' of layers which are transmitted with PUSCH antenna port 1000 and PUSCH antenna port 1002 in indicated TPMI(s), and UL PT-RS port 1 is associated with the UL layer 'y' of layers which are transmitted with PUSCH antenna port 1001 and PUSCH antenna port 1003 in indicated TPMI(s), where 'x' and/or 'y' are given by DCI parameter '*PTRS-DMRS association'* as shown in DCI format 0\_1 and DCI format 0\_2 described in Clause 7.3.1 of [5, TS38.212].  - For PUSCH transmission with 8 ports, PUSCH antenna port 1000, 1001, 1004 and 1005 in indicated TPMI(s) share PT-RS port 0, and PUSCH antenna port 1002, 1003, 1006 and 1007 in indicated TPMI(s) share PT-RS port 1.   * UL PT-RS port 0 is associated with the UL layer 'x' of layers which are transmitted with one or more of PUSCH antenna port 1000, 1001, 1004 and 1005 in indicated TPMI(s), and UL PT-RS port 1 is associated with the UL layer 'y' of layers which are transmitted with one or more of PUSCH antenna port 1002, 1003, 1006 and 1007 in indicated TPMI(s), where 'x' and/or 'y' are given by DCI parameter '*PTRS-DMRS association*' as shown in DCI format 0\_1 and DCI format 0\_2 described in Clause 7.3.1 of [5, TS38.212].   If a UE is scheduled with two codewords,  - if the UE is configured with the higher layer parameter *maxNrofPorts* in *PTRS-UplinkConfig* set to 'n1', the PT-RS port is associated with the one of DM-RS ports indicated by DCI field *PTRS-DMRS association* for the codeword with the higher MCS. If the MCS indices of the two codewords are the same, the PT-RS antenna port is associated with codeword 0. When a codeword is scheduled to transmit PUSCH for retransmission, the MCS for determining PT-RS association to codeword is obtained from the DCI for the same transport block in the initial transmission.  - if the UE is configured with the higher layer parameter *maxNrofPorts* in *PTRS-UplinkConfig* set to 'n2', each PT-RS port is associated with the one of DM-RS ports indicated by DCI field ‘*PTRS-DMRS association*’. ~~[PUSCH antenna port 1000, 1001, 1004 and 1005 share PT-RS port 0, and PUSCH antenna port 1002, 1003, 1006 and 1007 share PT-RS port 1.]~~  \*\*\* Unchanged parts are omitted \*\*\* |

Relevant side information can be found in R1-2310466.

**Agreement**

Support to apply Rel-16 low PAPR RS onto Rel-18 enhanced DMRS types (i.e., different DMRS sequence can be applied to DMRS ports included in different CDM group)

* Note: It is up to editors whether/how to specify the above.

**Agreement**

Adopt the following TP for TS 38.214 v18.0.0.

* Reason for change: The text in current TS 38.214 v18.0.0 clause 6.2.2 describes UE behaviour of DMRS configuration type of MsgA PUSCH with [ ]. However, based on TS38.211 v18.0.0, it is clear that Rel.15 Type1 DMRS is applied to MsgA PUSCH. Hence, there is no need to specify it in TS28.214.
* Summary of change: Delete texts in [ ].
* Consequences if not approved: The behaviour of MsgA PUSCH DMRS type is not correct.

|  |
| --- |
| **6.2.2 UE DM-RS transmission procedure**  \*\*\* Unchanged parts are omitted \*\*\*  ~~[For MsgA PUSCH transmission, the UE is not expected to be configured with the higher layer parameters [~~*~~enhanced-dmrs-Type\_r18~~*~~] set to ‘enabled’.]~~  \*\*\* Unchanged parts are omitted \*\*\* |

**Agreement**

Adopt the following text proposal in TS38.214 v18.0.0.

* Reason for change: The text in current TS 38.214 v18.0.0 clause 5.1.6.2 describes the scheduling restriction if UE does not support orphan RE capability for eType1 DMRS. However, UE behaviour of the scheduling restriction for M-TRP FDM 2a/2b is not captured.
* Summary of change: Specify the scheduling restriction, if UE does not support orphan RE capability for eType1 DMRS, for M-TRP FDM 2a/2b.
* Consequences if not approved: The scheduling restriction, if UE does not support orphan RE capability for eType1 DMRS, for M-TRP FDM 2a/2b is not correct.

|  |
| --- |
| **5.1.6.2 DM-RS reception procedure**  < Unchanged parts are omitted >  ~~For DM-RS configuration enhanced type 1, when UE is not indicating UE capability of [~~*~~noSchedulingRestriction-r18~~*~~] except for PDSCH , the UE shall assume the number of consecutively scheduled PRBs are even, and the offset of the scheduled PRB from common resource block 0 is even number.~~  For DM-RS configuration enhanced type 1,   * + if a UE is configured with the higher layer parameter *repetitionScheme* set to *'fdmSchemeA'* or ‘*fdmSchemeB*’, and 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 a UE is not indicating UE capability of [*noSchedulingRestrictionForFDMSchemes-r18*], the UE shall assume that the number of consecutively scheduled PRBs for PDSCH for each TCI-state is even, and the offset of the scheduled PRB from common resource block 0 for PDSCH for each TCI-state is even number.   + otherwise,   + if the UE is not indicating UE capability of [*noSchedulingRestriction-r18*], the UE shall assume the number of consecutively scheduled PRBs for PDSCH is even, and the offset of the scheduled PRB for PDSCH from common resource block 0 is even number.   < Unchanged parts are omitted > |

**Agreement**

Adopt the following TP for TS 38.214 v18.0.0.

* Reason for change: The text in current TS 38.214 v18.0.0 clause 6.2.3.1 describes PTRS association for 2-port PTRS for two codeword case. However, the same UE behabiour is already specified in other part in clause 6.2.3.1 in TS 38.214 v18.0.0.
* Summary of change: Remove the duplicated text.
* Consequences if not approved: The same UE behaviour is specified in two parts in clause 6.2.3.1 in TS 38.214 v18.0.0, and it makes difficult to understand the spec.

|  |
| --- |
| 6.2.3.1 UE PT-RS transmission procedure when transform precoding is not enabled  < Unchanged parts are omitted >  If a UE is scheduled with two codewords,  - if the UE is configured with the higher layer parameter *maxNrofPorts* in *PTRS-UplinkConfig* set to 'n1', the PT-RS port is associated with the one of DM-RS ports indicated by DCI field *PTRS-DMRS association* for the codeword with the higher MCS. If the MCS indices of the two codewords are the same, the PT-RS antenna port is associated with codeword 0. When a codeword is scheduled to transmit PUSCH for retransmission, the MCS for determining PT-RS association to codeword is obtained from the DCI for the same transport block in the initial transmission.  ~~- if the UE is configured with the higher layer parameter~~ *~~maxNrofPorts~~* ~~in~~ *~~PTRS-UplinkConfig~~* ~~set to 'n2', each PT-RS port is associated with the one of DM-RS ports indicated by DCI field ‘~~*~~PTRS-DMRS association~~*~~’~~.  < Unchanged parts are omitted > |

**Agreement**

Adopt the following text proposal in TS38.214 v18.0.0.

* Reason for change: The scheduling restriction of orphan RE or eType1 is specified in current TS 38.214 v18.0.0 clause 5.1.6.2. However, the current scheduling restriction cannot ensure orthogonality because the PRBs not available for PDSCH are variable (e.g. PRBs not available for PDSCH declared by RateMatchPattern are configured with 1RB granularity and a symbol level bitmap, leading to the second restriction can’t avoid some orphan RE cases caused by PDSCH rate matching).
* Summary of change: Clarify the offset of the scheduling restriction is the offset of each set of consecutively scheduled PRBs.
* Consequences if not approved: Rel-18 eType 1 DMRS ports cannot be orthogonal for scheduled in MU-MIMO scenario for some cases.

|  |
| --- |
| *5.1.6.2 DM-RS reception procedure*  < Unchanged parts are omitted >  For DM-RS configuration enhanced type 1, when UE is not indicating UE capability of [*noSchedulingRestriction-r18*], the UE shall assume the number of consecutively scheduled PRBs are even, and the offset of ~~the~~ each set of consecutively scheduled PRBs from common resource block 0 is even number.  < Unchanged parts are omitted > |

**Agreement**

Introduce a UE feature group to indicate the whether/how to support Rel-18 DMRS and PDSCH processing capability 2 simultaneously

* + In this feature group, the UE can additionally report relaxation on processing delay for PDSCH processing capability 2
    - FFS: Details of the relaxation on processing delay

**Conclusion**

* + It is understood that there can be a performance degradation in Rel.18 eType 2 DMRS for PDSCH when the either one of following conditions is not satisfied.
    - The number of consecutively scheduled PRBs for PDSCH is even.
    - The number of PRBs offset of scheduled PDSCH from point A (common resource block 0) is even.
  + However, there is no consensus in RAN1 to introduce additional scheduling restriction for eType2 DMRS for PDSCH to solve the above issue.

**Agreement**

For the antenna ports indication in Rel.18 eType2 DMRS ports with *maxLength* = 1 for PUSCH for rank 1-4 in RAN1#114 agreement,

* + Remove all remaining rows with [ ].

**Agreement**

For the antenna ports indication in Rel.18 eType2 DMRS ports with *maxLength* = 2 for PUSCH for rank 1-4 in RAN1#114 agreement,

* + Remove all remaining rows with [ ].

**Agreement**

For the antenna ports indication in Rel.18 eType1 DMRS ports with *maxLength* = 2 for PUSCH for rank 1-4 in RAN1#114 agreement, additionally support/remove the following rows:

* For rank 2 table: support row 21-29, remove row 13, 18, 19.
* For rank 3 table: support row 3-5 and row 11-14 with following modification of row 3, and remove row 9,10.
* For rank 4 table: support row 4, row 7, row 11-16, with following modification of row 7

Table 7.3.1.1.2-48: Antenna port(s), transform precoder is disabled, *dmrs-Type*=eType1, *maxLength*=2, rank = 3

|  |  |  |  |
| --- | --- | --- | --- |
| **Value** | **Number of DMRS CDM group(s) without data** | **DMRS port(s)** | **Number of front-load symbols** |
| ~~[~~3 | 2 | 9-11 ~~8-10~~ | 1~~]~~ |

Table 7.3.1.1.2-49: Antenna port(s), transform precoder is disabled, *dmrs-Type*=eType1, *maxLength*=2, rank = 4

|  |  |  |  |
| --- | --- | --- | --- |
| **Value** | **Number of DMRS CDM group(s) without data** | **DMRS port(s)** | **Number of front-load symbols** |
| ~~[~~7 | 2 | 1,3,5,7 ~~8,10,12,14~~ | 2~~]~~ |

**Conclusion**

For the antenna ports indication in Rel.18 eType1 DMRS ports with *maxLength* = 1 for PUSCH for rank 5-8, no more DMRS ports combinations are supported in Rel.18.

**Conclusion**

For the antenna ports indication in Rel.18 eType1 DMRS ports with *maxLength* = 2 for PUSCH for rank 5-8, no more DMRS ports combinations are supported in Rel.18.

**Conclusion**

For the antenna ports indication in Rel.18 eType2 DMRS ports with *maxLength* = 1 for PUSCH for rank 5-8, no more DMRS ports combinations are supported in Rel.18.

**Conclusion**

For the antenna ports indication in Rel.18 eType2 DMRS ports with *maxLength* = 2 for PUSCH for rank 5-8, no more DMRS ports combinations are supported in Rel.18.

**Agreement**

* When the UE is configured with the higher layer parameter *enhanced-dmrs-Type\_r18*, the UE does not expect to be configured with *dmrs-FD-OCC-DisabledForRank1-PDSCH*.
* Adopt the following text proposal in TS38.214 v18.0.0.
  + Reason for change: The text of OCC disabling in current TS 38.214 v18.0.0 clause 5.1.6.2 is applicable irrespective of configuration of *enhanced-dmrs-Type\_r18*. However, it reduces MU capacity, which is not aligned with purpose of Rel.18 DMRS ports.
  + Summary of change: The text of OCC disabling is not applicable if UE is configured with *enhanced-dmrs-Type\_r18*.
  + Consequence if not approved: UE behaviour when OCC disabling is configured is not correct for Rel.18 DMRS.

|  |
| --- |
| 5.1.6.2 DM-RS reception procedure  < Unchanged parts are omitted >  If a UE is configured with higher layer parameter *dmrs-FD-OCC-DisabledForRank1-PDSCH* and the UE is scheduled with PDSCH with single DM-RS port, the UE may assume that set of orthogonal DM-RS antenna ports from the same CDM group using different set of *w*f(*k*') codes are not associated with the transmission of PDSCH to another UE.  If a UE is configured with higher layer parameter *enhanced-dmrs-Type\_r18*, the UE does not expect to be configured with *dmrs-FD-OCC-DisabledForRank1-PDSCH*.  < Unchanged parts are omitted > |

**Conclusion**

For UL 8Tx transmission, there is no consensus to reuse the reserved field in antenna port field for other purposes.

**Agreement**

Adopt the text proposal for TS38.211 on cyclic shift / comb offset hopping ID notation:

|  |
| --- |
| 6.4.1.4.2 Sequence generation  <Unchanged text is omitted>  The pseudo-random sequence is defined by clause 5.2.1 and shall be initialized with at the beginning of each radio frame for which , where the cyclic-shift hopping identity is contained in the higher-layer parameter *cyclicShiftHopping*.  <Unchanged text is omitted>  6.4.1.4.3 Mapping to physical resources  <Unchanged text is omitted>  The pseudo-random sequence is defined by clause 5.2.1 and shall be initialized with at the beginning of each radio frame for which , where the comb hopping identity is contained in the higher-layer parameter *combOffsetHopping*.  <Unchanged text is omitted> |

* Additional information
  + Reason for change: It was agreed that the same ID is to be used for comb offset hopping and cyclic shift hopping, if both are configured for a same SRS resource. Current spec uses different notations for the ID in comb offset hopping and cyclic shift hopping.
  + Summary for change: Update with the same hopping ID notation.
  + Consequences if not approved: Confusion may arise regarding whether a same hopping ID shall be used.
  + TP is for TS38.211 v18.0.0.

**Agreement**

Adopt the text proposal for TS38.211 on cyclic shift / comb offset hopping subset entry indexing:

|  |
| --- |
| 6.4.1.4.2 Sequence generation  <Unchanged text is omitted>  where and is the th entry and the cardinality of the set  respectively, where is given by the higher-layer parameter *cyclicShiftHoppingSubset* if configured, otherwise .  <Unchanged text is omitted>  6.4.1.4.3 Mapping to physical resources  <Unchanged text is omitted>  where and is the th entry and the cardinality of the set  respectively, where is given by the higher-layer parameter *combOffsetHoppingSubset* if configured, otherwise .  <Unchanged text is omitted> |

* Additional information
  + Reason for change: Array index of n should correspond to (n+1)th entry of the array, if the index starts from 0.
  + Summary for change: Correct the array index of n to (n+1).
  + Consequences if not approved: Incorrect entry may be used.
  + TP is for TS38.211 v18.0.0.

**Agreement**

Adopt the text proposal for TS38.211 on cyclic shift / comb offset hopping subset bitmap:

|  |
| --- |
| 6.4.1.4.2 Sequence generation  <Unchanged text is omitted>  where and is the (+1)th entry and the cardinality of the set  respectively, where is given by the higher-layer parameter *cyclicShiftHoppingSubset* if configured, otherwise . The higher-layer parameter [*cyclicShiftHoppingSubset*] includes a bitmap of bits with bits being set to 1, where the (*n+1)*th bit being set to 1 corresponds to  <Unchanged text is omitted>  6.4.1.4.3 Mapping to physical resources  <Unchanged text is omitted>  where and is the (+1)th entry and the cardinality of the set  respectively, where is given by the higher-layer parameter *combOffsetHoppingSubset* if configured, otherwise . The higher-layer parameter [*combOffsetHoppingSubset*] includes a bitmap of bits with bits being set to 1, where the (*n+1)*th bit being set to 1 corresponds to  <Unchanged text is omitted> |

* Additional information
  + Reason for change: The hopping subset is not described.
  + Summary for change: Describe the hopping subset based on the configured RRC parameter. Also correct the array index of n to (n+1).
  + Consequences if not approved: RAN1 specs may be incomplete and it is unclear how to interpret/use the configured RRC parameter.
  + TP is for TS38.211 v18.0.0.

**Agreement**

SRS comb offset hopping / cyclic shift hopping can be configured for a SRS resource in a SRS resource set with usage ‘codebook’.

* SRS comb offset hopping / cyclic shift hopping are not supported for a SRS resource in a SRS resource set with usage ‘nonCodebook’ or ‘beamManagement’.

**Agreement**

Adopt the text proposal for TS38.214 on cyclic shift hopping subset and finer granularity configuration:

|  |
| --- |
| 6.2.1 UE sounding procedure  <Unchanged text is omitted>  - Cyclic shift, as defined by the higher layer parameter *cyclicShift-n2*, *cyclicShift-n4, or cyclicShift-n8* for transmission comb value 2, 4 or 8, and described in clause 6.4.1.4 of [4, TS 38.211]. When cyclic shift hopping is configured by the higher layer parameter [*cyclicShiftHopping*] for an SRS resource in an SRS resource set with the usage configured as ‘*antennaSwitching’*, subject to UE capabilities, cyclic shift is updated at every symbol as described in [clause 6,4,1,4 of [4, TS 38.211]]. For the cyclic shift hopping, a UE can be configured with a subset of cyclic shifts by the higher layer parameter [*cyclicShiftHoppingSubset*], where the cyclic shift hopping is performed only across the cyclic shifts configured in the subset. For the cyclic shift hopping, a UE can be configured with finer hopping granularity ~~of~~  by the higher layer parameter [*hoppingFinerGranularity*]*.* The UE is not expecting that [*hoppingFinerGranularity*] is configured when [*cyclicShiftHoppingSubset*] is configured for an SRS resource. The UE is not expecting that the cyclic shift hopping and the higher layer parameter [*tdm*] are configured simultaneously for an SRS resource.  <Unchanged text is omitted> |

* Additional information
  + Reason for change: Cyclic shift finer hopping granularity is not described in TS38.214, and the agreement that finer hopping granularity and hopping subset cannot be configured to the same SRS resource is not reflected.
  + Summary for change: Describe the cyclic shift finer hopping granularity based on the configured RRC parameter. Add that finer hopping granularity and hopping subset cannot be configured to the same SRS resource. Also clarify that ‘configured simultaneously’ means ‘configured simultaneously for an SRS resource’.
  + Consequences if not approved: RAN1 specs may be incomplete regarding cyclic shift finer hopping granularity.
  + TP is for TS38.214 v18.0.0.

**Agreement**

Adopt the text proposal for TS38.211 on cyclic shift hopping finer granularity:

|  |
| --- |
| 6.4.1.4.2 Sequence generation  <Unchanged text is omitted>  If the higher-layer parameter *hoppingFinerGranularity* is configured ~~and the higher-layer parameter~~ *~~cyclicShiftHoppingSubset~~* ~~is not configured,~~ , otherwise .  <Unchanged text is omitted> |

* Additional information
  + Reason for change: Finer hopping granularity and hopping subset cannot be configured to the same SRS resource, and thus the second part of the If condition should be removed.
  + Summary for change: Remove ‘and the higher-layer parameter cyclicShiftHoppingSubset is not configured’.
  + Consequences if not approved: Confusion may arise regarding the ‘otherwise’ part.
  + TP is for TS38.211 v18.0.0.

**Agreement**

Adopt the text proposal for TS38.214 on the frequency hopping behavior when TDM or comb offset hopping is configured:

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| --- |
| 6.2.1 UE SRS frequency hopping procedure  If for a SRS resource, the higher-layer parameter [*tdm*] is configured or higher-layer parameter [combOffsetHopping] is configured, the corresponding UE SRS frequency hopping procedure is specified in clause 6.4.1.4.3 of [4, TS 38.211]. If for a SRS resource, the higher-layer parameter [*tdm*] is not configured and higher-layer parameter [combOffsetHopping] is not configured, the UE SRS frequency hopping procedure is specified in clause 6.4.1.4.3 of [4, TS 38.211] and this clause.  <Unchanged text is omitted> |

* Additional information
  + Reason for change: TS38.214 Clause 6.2.1.1 describes the SRS frequency hopping procedure. However, the description covers only the cases without TDM and without comb offset hopping.
  + Summary for change: Add description of SRS frequency hopping procedure with TDM or with comb offset hopping by referring to TS38.211.
  + Consequences if not approved: TS38.214 Clause 6.2.1.1 is incomplete.
  + TP is for TS38.214 v18.0.0.

**Agreement**

Adopt the text proposal for TS38.214 on removing the limitation of no more than one SRS resource set to be triggered/configured:

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| --- |
| 6.2.1.2 UE sounding procedure for DL CSI acquisition  <Unchanged text is omitted>  For 1T2R, 1T4R, 2T4R, 1T6R, 1T8R, 2T6R, 2T8R, or 4T8R, ~~or 8T8R,~~ the UE shall not expect to be configured or triggered with more than one SRS resource set with higher layer parameter *usage* set as 'antennaSwitching' in the same slot. For 1T=1R, 2T=2R 4T=4R, or 8T=8R, the UE shall not expect to be configured or triggered with more than one SRS resource set with higher layer parameter *usage* set as 'antennaSwitching' in the same symbol.  <Unchanged text is omitted> |

* Additional information
  + Reason for change: The per-slot restriction for antennaSwitching applies to xTyR where x<y, but 8T8R was included.
  + Summary for change: Remove 8T8R from the per-slot restriction.
  + Consequences if not approved: Unnecessary restriction for 8T8R.
  + TP is for TS38.214 v18.0.0.

**Agreement**

Adopt the text proposal for TS38.214 on allowing 2 SP SRS resource sets for 8T8R per UE capability:

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| --- |
| 6.2.1.2 UE sounding procedure for DL CSI acquisition  <Unchanged text is omitted>  - For 1T=1R, or 2T=2R, 4T=4R or 8T=8R, up to two SRS resource sets each with one SRS resource can be configured, where the number of SRS ports for each resource is equal to 1, 2, 4 or 8 if the UE is not indicating *srs-AntennaSwitching2SP-1Periodic*. Two SRS resource sets configured with *resourceType* in *SRS-ResourceSet* set to '*semi-persistent*' and one SRS resource set configured with *resourceType* in *SRS-ResourceSet* set to '*periodic*' can be configured and the two SRS resource sets configured with '*semi-persistent*' are not activated at the same time, or up to two SRS resource sets can be configured, if the UE is indicating *srs-AntennaSwitching2SP-1Periodic* or [*srs-AntennaSwitching2SP-1Periodic8T8R*], where each SRS resource set has one SRS resource, the number of SRS ports for each resource is equal to 1, 2, 4~~[~~, or 8~~]~~ or  <Unchanged text is omitted> |

* Additional information
  + Reason for change: It was agreed that 8T8R can have the same maximum number of SRS resource sets configured.
  + Summary for change: Remove the brackets for 8 ports, and add the capability for 8T8R with 2 semi-persistent and 1 periodic SRS resource set.
  + Consequences if not approved: Incomplete support for 8T8R.
  + TP is for TS38.214 v18.0.0.

**Conclusion**

For an 8-port SRS resource in a SRS resource set with usage ‘codebook’ / ‘antennaSwitching’ and with TDM factor s = 2, ~~the 8 ports being fully/partially coherent,~~ when the s subsets of ports are mapped onto m ≥ 2 OFDM symbols in a slot according to the pattern {{1, 2, …, s}, …, {1, 2, …, s}} (totally m/s groups of {1, 2, …, s}), and when the SRS transmission on a subset of the s OFDM symbols within a group of {1, 2, …, s} is dropped, the UE still transmits the SRS on the rest of OFDM symbols within the group of {1, 2, …, s}.

* + Above does not imply that UE can or cannot maintain phase coherence from partially dropped SRS resource to the next PUSCH transmission
  + (Agreement) Prepare a LS to inform RAN4 and ask if the UE can or cannot maintain phase coherence

No additional RAN1 spec change will be introduced to support this feature

LS to RAN4 is endorsed in R1-2310645

Enhanced uplink transmission

**Agreement**

For single TRP operation, when single-DCI STxMP SDM or SFN is configured and two SRS resource sets for CB/NCB are configured:

* If one Type-1 CG PUSCH RRC configuration contains only one SRI field and/or one TPMI field, the PUSCH transmission of this CG PUSCH is associated with the first SRS resource set if the first indicated TCI state is applied, and the PUSCH transmission of this CG PUSCH is associated with the second SRS resource set if the second indicated TCI state is applied.

**Agreement**

Adopt the following TP for TS 38.214 v18.0.0

* Reason for change: The description on RRC parameter of maximal number of UL PTRS port is not accurate.
* Summary of change: Change text to clarify that if UE supports full coherent, the legacy RRC parameter for max number of UL PTRS should be 1.
* Consequences if not approved: the configuration of legacy RRC parameter for max number of PTRS when SDM is configured might be wrong:

|  |
| --- |
| 6.2.3.1 UE PT-RS transmission procedure when transform precoding is not enabled  < Unchanged parts are omitted >  If a UE has reported the capability of supporting full-coherent UL transmission ~~and the higher layer parameter~~ *~~multipanelScheme~~* ~~is not set to ‘sdmscheme’~~, the UE shall expect ~~the number of UL PT-RS ports~~ *maxNrofPorts* in *PTRS-UplinkConfig* to be configured as one if ULPT-RS is configured. If a UE has reported the capability of supporting full-coherent UL transmission and when the higher layer parameter *multipanelScheme* is set to ‘sdmscheme’, subject to UE capability, the UE can be configured with *maxNrofPortsforSDM* in *PTRS-UplinkConfig* set to n2, where at most one PT-RS port is associated with each SRS resource set with higher layer parameter *usage* set to ‘codebook’/’nonCodebook’.  < Unchanged parts are omitted > |

**Agreement**

Adopt the following TP for 38.214 v18.0.0 to clarify the conditions for CSI report in Rel-17 mTRP TDM repetition PUSCH:

* Reason for change: The text description in current TS 38.214 v18.0.0 suggests that the rules of mapping CSI report(s) in PUSCH with rel-17 TDM repetition also applies to Rel-18 STxMP SDM/SFN PUSCH. That is not agreed.
* Summary of change: Change text to clarify that the rule of mapping CSI reports in PUSCH of Rel-17 TDM repetition scheme only applies to PUSCH of Rel-17 TDM repetition scheme, but not STxMP SDM/SFN.
* Consequences if not approved: the behavior of this CSI report mapping specified only for Rel-17 TDM PUSCH is not correct:

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| --- |
| 6.1.2.1 Resource allocation in time domain  <omitted text>  For PUSCH repetition Type A, when higher layer parameter *multipanelScheme* is not provided and a DCI format 0\_1 and DCI format 0\_2 indicate codepoint "10" or "11" for the *SRS resource set indicator* and schedule aperiodic CSI report(s) on PUSCH with transport block by a '*CSI request'* field on a DCI, the CSI report(s) multiplexing is determined as follows  - if higher layer parameter *ap-CSI-MultiplexingMode* in *CSI-AperiodicTriggerState* is enabled and UCI other than CSI report(s) are not multiplexed on PUSCH, the CSI report(s) is transmitted separately only on the first transmission occasion associated with the first SRS resource set and the first transmission occasion associated with the second SRS resource set.  - otherwise, the CSI report(s) is transmitted only on the first transmission occasion.  For PUSCH transmissions of TB processing over multiple slots, when a DCI format 0\_1 and DCI format 0\_2 schedule aperiodic CSI report(s) on PUSCH with transport block by a 'CSI request' field on a DCI, the CSI report(s) is transmitted only on the first slot of the 𝑁 ∙ 𝐾 slots determined for the PUSCH transmission.  For PUSCH repetition Type B, when higher layer parameter *multipanelScheme* is not provided and a DCI format 0\_1 and DCI format 0\_2 indicate codepoint "10" or "11" for the *SRS resource set indicator* and schedule aperiodic CSI report(s) on PUSCH with transport block by a '*CSI request'* field on a DCI, CSI report(s) multiplexing is determined as follows  - if higher layer parameter *ap-CSI-MultiplexingMode* in *CSI-AperiodicTriggerState* is enabled and the first actual repetition associated with the first SRS resource set and the first actual repetition associated with the second SRS resource set have the same number of symbols and UCI other than CSI report(s) are not multiplexed on PUSCH, the CSI report(s) is multiplexed separately only on the first actual repetition associated with the first SRS resource set and first actual repetition associated with the second SRS resource set.  - otherwise, the CSI report(s) is multiplexed only on the first actual repetition.  The UE does not expect a different number of actual PT-RS ports for the two actual repetitions when the CSI report(s) is transmitted separately on two actual repetitions.  For PUSCH repetition Type A, when higher layer parameter *multipanelScheme* is not provided and a DCI format 0\_1 and DCI format 0\_2 indicate codepoint "10" or "11" for the *SRS resource set indicator* and schedule aperiodic CSI report(s) on PUSCH with no transport block by a '*CSI request'* field on a DCI, the number of repetitions is assumed to be 2 regardless of the value of *numberOfRepetitions* or *pusch-AggregationFactor* (if *numberOfRepetitions* is not present in the time domain resource allocation table), and transmission of CSI report(s) is determined as follows  - if higher layer parameter *ap-CSI-MultiplexingMode* in *CSI-AperiodicTriggerState* is enabled and UCI other than CSI report(s) are not multiplexed on PUSCH, the CSI report(s) is transmitted separately on the first transmission occasion and the second transmission occasion  - otherwise, the CSI report(s) is transmitted only on the first transmission occasion.  For PUSCH repetition Type B, when higher layer parameter *multipanelScheme* is not provided and a DCI format 0\_1 and DCI format 0\_2 indicate codepoint "10" or "11" for the *SRS resource set indicator* and schedule aperiodic CSI report(s) or activates semi-persistent CSI report(s) on PUSCH with no transport block by a '*CSI request'* field on a DCI, the number of nominal repetitions is always assumed to be 2 regardless of the value of *numberOfRepetitions*, and the first and second nominal repetitions are expected to be the same as the first and second actual repetitions, and transmission of CSI report(s) is determined as follows:  - if higher layer parameter *ap-CSI-MultiplexingMode* in *CSI-AperiodicTriggerState* is enabled for aperiodic CSI report(s) or higher layer paremeter *SP-CSI-MultiplexingMode* in *CSI-SemiPersistentOnPUSCH-TriggerState* is enabled for semi-persistent CSI report(s) and UCI other than CSI report(s) are not multiplexed on PUSCH, the CSI report(s) is transmitted separately on the first actual repetition and the second actual repetition  - otherwise, the CSI report(s) is transmitted only on the first actual repetition.  The UE does not expect a different number of actual PT-RS ports for the two actual repetitions when the CSI report(s) is transmitted separately on two actual repetitions.  For PUSCH repetition Type A, when higher layer parameter *multipanelScheme* is not provided and a DCI format 0\_1 and DCI format 0\_2 indicate codepoint "10" or "11" for the *SRS resource set indicator* and activate semi-persistent CSI report(s) on PUSCH with no transport block by a '*CSI request'* field on a DCI, or indicate the PUSCH repetition Type A carrying semi-persistent CSI report(s) without a corresponding PDCCH after being activated on PUSCH by a 'CSI request' field on a DCI, the number of repetitions is always assumed to be 2 regardless of the value of *numberOfRepetitions* or *pusch-AggregationFactor* (if *numberOfRepetitions* is not present in the time domain resource allocation table), and transmission of CSI report(s) is determined as follows  - if higher layer parameter *SP-CSI-MultiplexingMode* in *CSI-SemiPersistentOnPUSCH-TriggerState* is enabled and UCI other than CSI report(s) are not multiplexed on PUSCH, the CSI report(s) is transmitted separately on the first transmission occasion and the second transmission occasion  - otherwise, the CSI report(s) is transmitted only on the first transmission occasion.  For PUSCH repetition Type B, when higher layer parameter *multipanelScheme* is not provided and a DCI format 0\_1 and DCI format 0\_2 indicate codepoint "10" or "11" for the *SRS resource set indicator* and the PUSCH repetition Type B carrying semi-persistent CSI report(s) without a corresponding PDCCH after being activated on PUSCH by a '*CSI request'* field on a DCI, the number of nominal repetitions is always assumed to be 2 regardless of the value of *numberOfRepetitions*, and transmission of CSI report(s) is determined as follows  - if higher layer parameter *SP-CSI-MultiplexingMode* in *CSI-SemiPersistentOnPUSCH-TriggerState* is enabled and one of the first or second nominal repetition is the same as corresponding first or second actual repetition, the nominal repetition that is not having same actual repetition is omitted and the CSI report(s) is transmitted on the actual repetition that is not omitted.  - if higher layer parameter *SP-CSI-MultiplexingMode* in *CSI-SemiPersistentOnPUSCH-TriggerState* is enabled and the first and second nominal repetitions are the same as the first and second actual repetitions and the UCI other than CSI report(s) are not multiplexed on PUSCH, the CSI report(s) is transmitted separately on the first actual repetition and the second actual repetition  - otherwise, the CSI report(s) is transmitted only on the first actual repetition.  <omitted text> |

**Agreement**

Adopt the following TP for TS 38.214 v18.0.0

* Reason for change: TS38.214 v18.0.0 has two alternative text (both are in []) to describe the PTRS port for Type 1 CG PUSCH of SDM/SFN scheme.
* Summary of change: delete the text in the second [] and keep the text in the first [].
* Consequences if not approved: the behavior of PTRS for Type 1 CG PUSCH when single-DCI based STxMP SDM/SFN scheme is configured is not defined.

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| --- |
| ***6.2.3.1 UE PT-RS transmission procedure when transform precoding is not enabled***  <omitted text>  For codebook or non-codebook based UL transmission, 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. For a PUSCH corresponding to a configured grant Type 1 transmission, the UE may assume the association between UL PT-RS port(s) and DM-RS port(s) defined by value 0 in Table 7.3.1.1.2-25, value "00" in Table 7.3.1.1.1.2-26 ~~[~~or value "00" in Table 7.3.1.1.1.2-25a~~]~~ described in Clause 7.3.1 of [5, TS38.212].~~[ For a PUSCH corresponding to a configured grant Type 1 transmission and when the higher layer parameter~~ *~~multipanelScheme~~* ~~is set to ‘SFNscheme’, the UE may assume the association between UL PT-RS port(s) and DM-RS port(s) defined by value 0 in Table 7.3.1.1.2-25 or value "00" in Table 7.3.1.1.1.2-26 described in Clause 7.3.1 of [5, TS38.212]. For a PUSCH corresponding to a configured grant Type 1 transmission and, when the higher layer parameter~~ *~~multipanelScheme~~* ~~is set to ‘sdmscheme’, the UE may assume the association between UL PT-RS port(s) and DM-RS port(s) defined by value 0 in Table 7.3.1.1.2-25 or value "00" in Table 7.3.1.1.1.2-25a described in Clause 7.3.1 of [5, TS38.212].]~~  <omitted text> |

**Agreement**

Per previous agreement, when multi-DCI based STxMP PUSCH+PUSCH is configured, the maximal configured number of PTRS ports per PUSCH is not more than 1.

**Agreement**

When multi-DCI based STxMP PUSCH+PUSCH is configured:

* For Type 1 CG PUSCH, the UE expects *srs-ResourceSetId* in *rrc-ConfiguredUplinkGrant* to indicate either the first or the second SRS resource set with usage *'codebook'* or *'nonCodeBook'* in *srs-ResourceSetToAddModList*
* For Type 1 CG PUSCH, simultaneous transmission of two PUSCHs is conditioned on the two PUSCHs being associated with different *coresetPoolIndex* values

**Agreement**

Adopt the following TP for TS 38.214 v18.0.0:

* Reason for change: The text in current TS 38.214 v18.0.0 Section 6 contains two parts of text, both in [], that are used to describe the same condition of PUSCH+PUSCH overlapping of multi-DCI based STxMP PUSCH+PUSCH. We need to delete one and keep the other one to complete the specification.
* Summary of change: Delete the text in the first [] and keep the text in the second [].
* Consequences if not approved: The condition of PUSCH+PUSCH of rel-18 is not correctly captured in the specification

|  |
| --- |
| **TS 38.214 v18.0.0**  **6.1 UE procedure for transmitting the physical uplink shared channel**  <omitted text>  ~~[Except for the case when a UE is configured by higher layer parameter~~ *~~PDCCH-Config~~* ~~that contains two different values of~~ *~~coresetPoolIndex~~* ~~in~~ *~~ControlResourceSet~~* ~~and the UE is configured with~~ *~~enableSTx2PofmDCI~~* ~~and two PUSCHs are associated with different values of~~ *~~coresetPoolIndex,~~* ~~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.~~]~~  <omitted text> |

**Agreement**

Adopt following editorial change for TS 38.211.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| <omitted unchanged part>  **Table 6.3.1.5-12: Precoding matrix for *codebook1=ng1n4n1* and four-layer transmission using eight antenna ports with transform precoding disabled.**   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **TPMI index** | **(ordered from left to right in increasing order of TPMI index)** | | | | | 0 – 3 |  |  |  |  |   <omitted unchanged part> |

**Agreement**

Adopt the following text proposal to TS 38.211.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| <omitted unchanged part>  **Table 6.3.1.5-45: Intermediate precoding matrix for *codebook3* and seven-layer transmission using eight antenna ports with transform precoding disabled.**   |  |  | | --- | --- | | **TPMI index** | **Intermediate precoder matrix** | | 0 – ~~7~~31 |  |   <omitted unchanged part> |

**Agreement**

Adopt the following text proposal to TS 38.211.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **6.3.1.5 Precoding**  < omitted unchanged parts >  **Table 6.3.1.5-44: Intermediate precoding matrix for *codebook3* and six-layer transmission using eight antenna ports with transform precoding disabled.**   |  |  | | --- | --- | | **TPMI index** | **Intermediate precoder matrix** | | 0 – 7 |  | | 8 – 15 |  | | 16 – 79 |  |   < omitted unchanged parts > |

**Agreement**

Adopt the following text proposal to TS 38.211.

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| --- |
| 6.3.1.5 Precoding  <omitted unchanged part>  - the intermediate precoding matrix is given by Tables 6.3.1.5-29 to 6.3.1.5-47 with representing the all-zero matrix with rows and columns;  - the submatrices are given by Tables 6.3.1.5-25 to 6.3.1.5-28 and 6.3.1.5-37 to 6.3.1.5-38.  The TPMI index used in the tables above is obtained from the DCI scheduling the uplink transmission or the higher layer parameters according to the procedure in [6, TS 38.214].  <omitted unchanged part> |

**Agreement**

Adopt the following text proposal to TS 38.212.

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| --- |
| 5.4.2.1 Bit selection  <omitted unchanged part>  For one TB for UL-SCH, or for one TB for DL-SCH/PCH except for DL-SCH with PDSCH scheduled by DCI format 4\_0/4\_1/4\_2,  - maximum number of layers for one TB for UL-SCH is given by the minimum of X and 4, where  - if the higher layer parameter *maxMIMO-Layers* of *PUSCH-ServingCellConfig* of the serving cell is configured, X is given by that parameter  - elseif the higher layer parameter *maxRank* of *pusch-Config* of the serving cell is configured, X is given by the maximum value of *maxRank* across all BWPs of the serving cell  - otherwise, X is given by the maximum number of layers for PUSCH supported by the UE for the serving cell  - maximum number of layers for one TB for DL-SCH/PCH is given by the minimum of X and 4, where  - if the higher layer parameter *maxMIMO-Layers* of *PDSCH-ServingCellConfig* of the serving cell is configured, X is given by that parameter  - otherwise, X is given by the maximum number of layers for PDSCH supported by the UE for the serving cell  <omitted unchanged part> |

**Agreement**

Adopt the following text proposal to TS 38.212.

|  |
| --- |
| **7.3.1.1.2 Format 0\_1**  <omitted unchanged part>  UL-SCH indicator – 0 or 1 bit as follows  - 0 bit if the number of scheduled PUSCH indicated by the Time domain resource assignment field is larger than 1;  - 1 bit otherwise. A value of "1" indicates UL-SCH shall be transmitted on the PUSCH and a value of "0" indicates UL-SCH shall not be transmitted on the PUSCH. If a UE does not support triggering SRS only in DCI, except for DCI format 0\_1 with CRC scrambled by SP-CSI-RNTI, the UE is not expected to receive a DCI format 0\_1 with UL-SCH indicator of "0" and CSI request of all zero(s). If a UE supports triggering SRS only in DCI, except for DCI format 0\_1 with CRC scrambled by SP-CSI-RNTI, the UE is not expected to receive a DCI format 0\_1 with UL-SCH indicator of "0", CSI request of all zero(s) and SRS request of all zero(s). UE is not expected to receive a DCI format 0\_1 with UL-SCH indicator of "0" when indicated number of PUSCH transmission layers is larger than 4.  <omitted unchanged part> |

**Agreement**

For an 8TX UE, with Ng=8, configured for full power transmission with ‘fullpowerMode1’, the following precoder is supported.

|  |
| --- |
| *Rank = 4* |
|  |

If additional precoders cannot be agreed in RAN1#114bis, no additional precoders will be introduced in Rel-18.

**Agreement**

Adopt the following text proposal to TS 38.212.

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| **7.3.1.1.2 Format 0\_1**  <Unchanged parts omitted>  **Table 7.3.1.1.2-5E: Precoding information and number of layers, for 8 antenna ports, if transform precoder is enabled or *maxRank*=1 or 2 or 3 if transform precoder is disabled, *CodebookType=Codebook1, ULcodebookFC-N1N2 = (4,1) or (2,2)***   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Bit field mapped to index | transform precoder is enabled ~~disabled~~, or *maxRank*=1 if transform precoder is disabled ~~enabled~~ | Bit field mapped to index | transform precoder is disabled, and *maxRank*=2 | Bit field mapped to index | transform precoder is disabled, and *maxRank=3* | | 0 | 1 layer: TPMI=0 | 0 | 1 layer: TPMI=0 | 0 | 1 layer: TPMI=0 | | 1 | 1 layer: TPMI=1 | 1 | 1 layer: TPMI=1 | 1 | 1 layer: TPMI=1 | | … | … | … | … | … | … | | 15 | 1 layer: TPMI=15 | 15 | 1 layer: TPMI=15 | 15 | 1 layer: TPMI=15 | |  |  | 16 | 2 layer2: TPMI=0 | 16 | 2 layer2: TPMI=0 | |  |  | 17 | 2 layer2: TPMI=1 | 17 | 2 layer2: TPMI=1 | |  |  | … | … | … | … | |  |  | 47 | 2 layers: TPMI=31 | 47 | 2 layers: TPMI=31 | |  |  | 48-63 | reserved | 48 | 3 layers: TPMI=0 | |  |  |  |  | 49 | 3 layers: TPMI=1 | |  |  |  |  | … | … | |  |  |  |  | 71 | 3 layers: TPMI=23 | |  |  |  |  | 72-127 | reserved |   <Unchanged parts omitted> |

**Agreement**

Adopt following text proposals for TS 38.212.

|  |
| --- |
| 7.3.1.1.2 Format 0\_1  <omitted unchanged part>  - Modulation and coding scheme – 5 bits as defined in Clause 6.1.4.1 of [6, TS 38.214]  - New data indicator – 1 bit  - Redundancy version – 2 bits as defined in Table 7.3.1.1.1-2  If "Bandwidth part indicator" field indicates a bandwidth part other than the active bandwidth part and the transport block 2 is configured for the indicated bandwidth part and the transport block 2 is not configured for the active bandwidth part, the UE assumes zeros are padded when interpreting the "Modulation and coding scheme", "New data indicator", and "Redundancy version" fields of transport block 2 according to Clause 12 of [5, TS38.213], and the UE ignores the "Modulation and coding scheme", "New data indicator", and "Redundancy version" fields of transport block 2 for the indicated bandwidth part.  <omitted unchanged part> |

**Agreement**

Adopt the following TP to TS 38.214.

|  |
| --- |
| <Unchanged parts omitted>  **6.1.1.1 Codebook based UL transmission**  …  A UE shall not expect to be configured with higher layer parameter *ul-FullPowerTransmission* set to 'fullpowerMode1*'* and *codebookSubset* or *codebookSubsetDCI-0-2* set to *'*fullAndPartialAndNonCoherent*'* simultaneously.  A UE shall not expect to be configured with higher layer parameter *ul-FullPowerTransmission* set to 'fullpowerMode1*'* and *CodebookType* set to *'*Codebook1*'* simultaneously.  The UE shall transmit PUSCH using the same antenna port(s) as the SRS port(s) in the SRS resource(s) indicated by the DCI format 0\_1 or 0\_2 or by *configuredGrantConfig* according to clause 6.1.2.3.  …  <Unchanged parts omitted> |

**Agreement**

Adopt the following text proposal to TS 38.212.

* **Note:** The content in this agreement may be further updated in RAN#115 according to RAN1#114b agreements.
* Reason for change: The current specifications in 38.212 does not include the agreed precoders for fullpowerMode1.
* Summary of change: Addition of new columns to the related existing tables, introducing new tables, and text corresponding to the agreed precoders for fullpowerMode1.
* Consequences if not approved: Incomplete support of fullpowerMode1.

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| ===========================Start of text proposal to TS 38.212=====================  7.3.1.1.2 Format 0\_1  *<Unchanged part omitted>*  - Precoding information and number of layers – number of bits determined by the following:  *<Unchanged part omitted>*  - 8 bits according to Table 7.3.1.1.2-5F for 8 antenna ports, if *CodebookType*=*Codebook4,* transform precoder is disabled, *maxRank*=5, 6, 7 or 8, *ul-FullPowerTransmission* is not configured or configured to *fullpowerMode2* or configured to *fullpower,* and according to *maxRank;*  - 6 or 7 or 8 bits according to Table 7.3.1.1.2-5G for 8 antenna ports, if *CodebookType*=*Codebook4,* transform precoder is disabled, *maxRank*=2, 3 or 4, *ul-FullPowerTransmission* is not configured or configured to *fullpowerMode2* or configured to *fullpower,* and according to *maxRank;*  - 3 bits according to Table 7.3.1.1.2-5H for 8 antenna ports, if *CodebookType*=*Codebook4,* transform precoder is enabled or maxRank=1 if transform precoder is disabled, *ul-FullPowerTransmission* is not configured or configured to *fullpowerMode2* or configured to *fullpower*.  - 10 bits according to Table 7.3.1.1.2-5I for 8 antenna ports, if *CodebookType*=*Codebook2,* transform precoder is disabled, *maxRank*=5, 6, 7 or 8, *ul-FullPowerTransmission* is not configured or configured to *fullpowerMode2* or configured to *fullpower,* and according to *maxRank;*  - 5, 9 or 10 bits according to Table 7.3.1.1.2-5J for 8 antenna ports, if *CodebookType*=*Codebook2*, transform precoder is enabled or *maxRank* =1, 2, 3 or 4 if transform precoder is disabled, *ul-FullPowerTransmission* is not configured or configured to *fullpowerMode2* or configured to *fullpower,* and according to transform precoder and *maxRank*;  - 10 bits according to Table 7.3.1.1.2-5K for 8 antenna ports, if *CodebookType*=*Codebook3,* transform precoder is disabled, *maxRank*=5, 6, 7 or 8, *ul-FullPowerTransmission* is not configured or configured to *fullpowerMode2* or configured to *fullpower*,and according to *maxRank;*  - 4, 7, 9 or 10 bits according to Table 7.3.1.1.2-5L for 8 antenna ports, if *CodebookType*=*Codebook3*, transform precoder is enabled or *maxRank* =1, 2, 3 or 4 if transform precoder is disabled, *ul-FullPowerTransmission* is not configured or configured to *fullpowerMode2* or configured to *fullpower,* and according to transform precoder and *maxRank*;  - 6 or 7 or 8 bits according to Table 7.3.1.1.2-5M for 8 antenna ports, if *CodebookType*=*Codebook4,* transform precoder is disabled, *maxRank*=2, ~~or~~ 3 or 4, *ul-FullPowerTransmission* is configured to *fullpowerMode1,* and according to *maxRank;*  - 4 bits according to Table 7.3.1.1.2-5N for 8 antenna ports, if *CodebookType*=*Codebook4,* transform precoder is enabled or maxRank=1 if transform precoder is disabled, *ul-FullPowerTransmission* is configured to *fullpowerMode1*.  - 6, 9 or 10 bits according to Table 7.3.1.1.2-5O for 8 antenna ports, if *CodebookType*=*Codebook2*, transform precoder is enabled or *maxRank* =1, 2, 3, 4 if transform precoder is disabled, *ul-FullPowerTransmission* is configured to *fullpowerMode1*;  - 5, 7, 9 or 10 bits according to Table 7.3.1.1.2-5P for 8 antenna ports, if *CodebookType*=*Codebook3*, transform precoder is enabled or *maxRank* =1, 2, 3, or 4 if transform precoder is disabled, *ul-FullPowerTransmission* is configured to *fullpowerMode1,* and according to transform precoder and *maxRank*;  - 8 or 9 bits according to Table 7.3.1.1.2-5Q for 8 antenna ports, if *CodebookType*=*Codebook4,* transform precoder is disabled, *maxRank*=5, 6, 7 or 8, *ul-FullPowerTransmission* is configured to *fullpowerMode1,* and according to *maxRank;*  - 10 bits according to Table 7.3.1.1.2-5R for 8 antenna ports, if *CodebookType*=*Codebook2,* transform precoder is disabled, *maxRank*=5, 6, 7 or 8, *ul-FullPowerTransmission* is configured to *fullpowerMode1,* and according to *maxRank;*  - 10 bits according to Table 7.3.1.1.2-5S for 8 antenna ports, if *CodebookType*=*Codebook3*, transform precoder is disabled, *maxRank* =5, 6, 7, or 8, *ul-FullPowerTransmission* is configured to *fullpowerMode1,* and according to *maxRank*;  *<Unchanged part omitted>*  **Table 7.3.1.1.2-5M: Precoding information and number of layers, for 8 antenna ports, if transform precoder is disabled, *maxRank* = 2, 3 or 4, *CodebookType=Codebook4,* and *ul-FullPowerTransmission* configured to *fullpowerMode1***   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Bit field mapped to index | *maxRank = 2* | Bit field mapped to index | *maxRank = 3* | Bit field mapped to index | *maxRank = 4* | | 0 | 1 layer: TPMI=0 | 0 | 1 layer: TPMI=0 | 0 | 1 layer: TPMI=0 | | … | … | … | … | … | … | | 7 | 1 layer: TPMI=7 | 7 | 1 layer: TPMI=7 | 7 | 1 layer: TPMI=7 | | 8 | 2 layers: TPMI=8 | 8 | 2 layers: TPMI=8 | 8 | 2 layers: TPMI=8 | | … | … | … | … | … | … | | 35 | 2 layers: TPMI=35 | 35 | 2 layers: TPMI=35 | 35 | 2 layers: TPMI=35 | | 36 | 1 layer:  TPMI=255 | 36 | 3 layers: TPMI=36 | 36 | 3 layers: TPMI=36 | | 37 | 2 layers:  TPMI=256 | … | … | … | … | | 38-63 | reserved | 91 | 3 layers: TPMI=91 | 91 | 3 layers: TPMI=91 | |  |  | 92 | 1 layer:  TPMI= 255 | 92 | 4 layers: TPMI=92 | |  |  | 93 | 2 layers:  TPMI= 256 | … | … | |  |  | 94 | 3 layers: 257 | 161 | 4 layers: TPMI=161 | |  |  | 95-127 | reserved | 162 | 1 layer: TPMI=255 | |  |  |  |  | 163 | 2 layers: TPMI=256 | |  |  |  |  | 164 | 3 layers: TPMI=257 | |  |  |  |  | 165-255 | reserved |   **Table 7.3.1.1.2-5N: Precoding information and number of layers, for 8 antenna ports, if transform precoder is enabled, or *maxRank*=1 if transform precoder is disabled, *CodebookType=Codebook4,* and *ul-FullPowerTransmission* configured to *fullpowerMode1***   |  |  | | --- | --- | | Bit field mapped to index | Precoding information and number of layers | | 0 | 1 layer: TPMI=0 | | … | … | | 7 | 1 layer: TPMI=7 | | 8 | 1 layer: TPMI= 255 | | 9-15 | reserved |   **Table 7.3.1.1.2-5O: Precoding information and number of layers, for 8 antenna ports, if transform precoder is enabled, or *maxRank* = 1, 2, 3, 4 if transform precoder is disabled, *CodebookType=Codebook2,* and *ul-FullPowerTransmission* configured to *fullpowerMode1***   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | Bit field mapped to index | Transform precoder is enabled, or *maxRank* = 1 if transform precoder is disabled | Bit field mapped to index | transform precoder is disabled *and maxRank = 2* | Bit field mapped to index | transform precoder is disabled *and maxRank = 3* | Bit field mapped to index | transform precoder is disabled *and maxRank = 4* | | 0 | 1 layer: TPMI=0 | 0 | 1 layer: TPMI=0 | 0 | 1 layer: TPMI=0 | 0 | 1 layer: TPMI=0 | | … | … | … | … | … | … | … | … | | 31 | 1 layer: TPMI=31 | 31 | 1 layer: TPMI=31 | 31 | 1 layer: TPMI=31 | 31 | 1 layer: TPMI=31 | | 32 | 1 layer: TPMI= 32 | 32 | 2 layers: TPMI=0 | 32 | 2 layers: TPMI=0 | 32 | 2 layers: TPMI=0 | | 33-63 | reserved | … | … | … | … | … | … | |  |  | 303 | 2 layers: TPMI=271 | 303 | 2 layers: TPMI=271 | 303 | 2 layers: TPMI=271 | |  |  | 304 | 1 layer: TPMI=32 | 304 | 3 layers: TPMI=0 | 304 | 3 layers: TPMI=0 | |  |  | 305-511 | reserved | … | … | … | … | |  |  |  |  | 567 | 3 layers: TPMI=263 | 567 | 3 layers: TPMI=263 | |  |  |  |  | 568 | 1 layer: TPMI=32 | 568 | 4 layers: TPMI=0 | |  |  |  |  | 569-1023 | reserved | … | … | |  |  |  |  |  |  | 635 | 4 layers: TPMI=67 | |  |  |  |  |  |  | 636 | 1 layer: TPMI=32 | |  |  |  |  |  |  | 637-1023 | reserved |   **Table 7.3.1.1.2-5P: Precoding information and number of layers, for 8 antenna ports, if transform precoder is enabled, or *maxRank* = 1, 2, 3, 4 if transform precoder is disabled, *CodebookType=Codebook3,* and *ul-FullPowerTransmission* is configured to *fullpowerMode1***   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | Bit field mapped to index | Transform precoder is enabled, or *maxRank* = 1 if transform precoder is disabled | Bit field mapped to index | transform precoder is disabled *and maxRank = 2* | Bit field mapped to index | transform precoder is disabled *and maxRank = 3* | Bit field mapped to index | transform precoder is disabled *and maxRank = 4* | | 0 | 1 layer: TPMI=0 | 0 | 1 layer: TPMI=0 | 0 | 1 layer: TPMI=0 | 0 | 1 layer: TPMI=0 | | … | … | … | … | … | … | … | … | | 15 | 1 layer: TPMI=15 | 15 | 1 layer: TPMI=15 | 15 | 1 layer: TPMI=15 | 15 | 1 layer: TPMI=15 | | 16 | 1 layer: TPMI= 16 | 16 | 2 layers: TPMI=0 | 16 | 2 layers: TPMI=0 | 16 | 2 layers: TPMI=0 | | 17-31 | reserved | … | … | … | … | … | … | |  |  | 119 | 2 layers: TPMI=103 | 119 | 2 layers: TPMI=103 | 119 | 2 layers: TPMI=103 | |  |  | 120 | 1 layer: TPMI=16 | 120 | 3 layers: TPMI=0 | 120 | 3 layers: TPMI=0 | |  |  | 121 | 2 layers: TPMI=104 | … | … | … | … | |  |  | 122-127 | reserved | 423 | 3 layers: TPMI=303 | 423 | 3 layers: TPMI=303 | |  |  |  |  | 424 | 1 layer: TPMI=16 | 424 | 4 layers: TPMI=0 | |  |  |  |  | 425 | 2 layers: TPMI=104 | … | … | |  |  |  |  | 426 | 3 layers: TPMI=304 | 703 | 4 layers: TPMI=279 | |  |  |  |  | 427-511 | reserved | 704 | 1 layer: TPMI=16 | |  |  |  |  |  |  | 705 | 2 layers: TPMI=104 | |  |  |  |  |  |  | 706 | 3 layers: TPMI=304 | |  |  |  |  |  |  | 707-1023 | reserved |   **Table 7.3.1.1.2-5Q: Precoding information and number of layers, for 8 antenna ports, if transform precoder is disabled, *maxRank* = 5, 6, 7, 8, *CodebookType=Codebook4,* and *ul-FullPowerTransmission* is configured to *fullpowerMode1***   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | Bit field mapped to index | *maxRank = 5* | Bit field mapped to index | *maxRank = 6* | Bit field mapped to index | *maxRank = 7* | Bit field mapped to index | *maxRank = 8* | | 0 | 1 layer: TPMI=0 | 0 | 1 layer: TPMI=0 | 0 | 1 layer: TPMI=0 | 0 | 1 layer: TPMI=0 | | … | … | … | … | … | … | … | … | | 7 | 1 layer: TPMI=7 | 7 | 1 layer: TPMI=7 | 7 | 1 layer: TPMI=7 | 7 | 1 layer: TPMI=7 | | 8 | 2 layers: TPMI=8 | 8 | 2 layers: TPMI=8 | 8 | 2 layers: TPMI=8 | 8 | 2 layers: TPMI=8 | | … | … | … | … | … | … | … | … | | 35 | 2 layers: TPMI=35 | 35 | 2 layers: TPMI=35 | 35 | 2 layers: TPMI=35 | 35 | 2 layers: TPMI=35 | | 36 | 3 layers: TPMI=36 | 36 | 3 layers: TPMI=36 | 36 | 3 layers: TPMI=36 | 36 | 3 layers: TPMI=36 | | … | … | … | … | … | … | … | … | | 91 | 3 layers: TPMI=91 | 91 | 3 layers: TPMI=91 | 91 | 3 layers: TPMI=91 | 91 | 3 layers: TPMI=91 | | 92 | 4 layers: TPMI=92 | 92 | 4 layers: TPMI=92 | 92 | 4 layers: TPMI=92 | 92 | 4 layers: TPMI=92 | | … | … | … | … | … | … | … | … | | 161 | 4 layers: TPMI=161 | 161 | 4 layers: TPMI=161 | 161 | 4 layers: TPMI=161 | 161 | 4 layers: TPMI=161 | | 162 | 5 layers: TPMI=162 | 162 | 5 layers: TPMI=162 | 162 | 5 layers: TPMI=162 | 162 | 5 layers: TPMI=162 | | … | … | … | … | … | … | … | … | | 217 | 5 layers: TPMI=217 | 217 | 5 layers: TPMI=217 | 217 | 5 layers: TPMI=217 | 217 | 5 layers: TPMI=217 | | 218 | 1 layer: TPMI=255 | 218 | 6 layers: TPMI=218 | 218 | 6 layers: TPMI=218 | 218 | 6 layers: TPMI=218 | | 219 | 2 layers: TPMI=256 | … | … | … | … | … | … | | 220 | 3 layers: TPMI=257 | 245 | 6 layers: TPMI=245 | 245 | 6 layers: TPMI=245 | 245 | 6 layers: TPMI=245 | | 221-255 | reserved | 246 | 1 layer: TPMI=255 | 246 | 7 layers: TPMI=246 | 246 | 7 layers: TPMI=246 | |  |  | 247 | 2 layers: TPMI=256 | … | … | … | … | |  |  | 248 | 3 layers: TPMI=257 | 253 | 7 layers: TPMI=253 | 253 | 7 layers: TPMI=253 | |  |  | 249-255 | reserved | 254 | 1 layer: TPMI=255 | 254 | 8 layers: TPMI=254 | |  |  |  |  | 255 | 2 layers: TPMI=256 | 255 | 1 layer: TPMI=255 | |  |  |  |  | 256 | 3 layers: TPMI=257 | 256 | 2 layers: TPMI=256 | |  |  |  |  | 257-511 | reserved | 257 | 3 layers: TPMI=257 | |  |  |  |  |  |  | 258-511 | reserved |   **Table 7.3.1.1.2-5R: Precoding information and number of layers, for 8 antenna ports, if transform precoder is disabled, *maxRank* = 5, 6, 7, 8, *CodebookType=Codebook2,* and *ul-FullPowerTransmission* is configured to *fullpowerMode1***   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | Bit field mapped to index | *maxRank = 5* | Bit field mapped to index | *maxRank = 6* | Bit field mapped to index | *maxRank = 7* | Bit field mapped to index | *maxRank = 8* | | 0 | 1 layer: TPMI=0 | 0 | 1 layer: TPMI=0 | 0 | 1 layer: TPMI=0 | 0 | 1 layer: TPMI=0 | | … | … | … | … | … | … | … | … | | 31 | 1 layer: TPMI=31 | 31 | 1 layer: TPMI=31 | 31 | 1 layer: TPMI=31 | 31 | 1 layer: TPMI=31 | | 32 | 2 layers: TPMI=0 | 32 | 2 layers: TPMI=0 | 32 | 2 layers: TPMI=0 | 32 | 2 layers: TPMI=0 | | … | … | … | … | … | … | … | … | | 303 | 2 layers: TPMI=271 | 303 | 2 layers: TPMI=271 | 303 | 2 layers: TPMI=271 | 303 | 2 layers: TPMI=271 | | 304 | 3 layers: TPMI=0 | 304 | 3 layers: TPMI=0 | 304 | 3 layers: TPMI=0 | 304 | 3 layers: TPMI=0 | | … | … | … | … | … | … | … | … | | 567 | 3 layers: TPMI=263 | 567 | 3 layers: TPMI=263 | 567 | 3 layers: TPMI=263 | 567 | 3 layers: TPMI=263 | | 568 | 4 layers: TPMI=0 | 568 | 4 layers: TPMI=0 | 568 | 4 layers: TPMI=0 | 568 | 4 layers: TPMI=0 | | … | … | … | … | … | … | … | … | | 635 | 4 layers: TPMI=67 | 635 | 4 layers: TPMI=67 | 635 | 4 layers: TPMI=67 | 635 | 4 layers: TPMI=67 | | 636 | 5 layers: TPMI=0 | 636 | 5 layers: TPMI=0 | 636 | 5 layers: TPMI=0 | 636 | 5 layers: TPMI=0 | | … | … | … | … | … | … | … | … | | 667 | 5 layers: TPMI=31 | 667 | 5 layers: TPMI=31 | 667 | 5 layers: TPMI=31 | 667 | 5 layers: TPMI=31 | | 668 | 1 layer: TPMI=32 | 668 | 6 layers: TPMI=0 | 668 | 6 layers: TPMI=0 | 668 | 6 layers: TPMI=0 | | 669-1023 | reserved | … | … | … | … | … | … | |  |  | 683 | 6 layers: TPMI=15 | 683 | 6 layers: TPMI=15 | 683 | 6 layers: TPMI=15 | |  |  | 684 | 1 layer: TPMI=32 | 684 | 7 layers: TPMI=0 | 684 | 7 layers: TPMI=0 | |  |  | 685-1023 | reserved | … | … | … | … | |  |  |  |  | 691 | 7 layers: TPMI=7 | 691 | 7 layers: TPMI=7 | |  |  |  |  | 692 | 1 layer: TPMI=32 | 692 | 8 layers: TPMI=0 | |  |  |  |  | 693-1023 | reserved | … | … | |  |  |  |  |  |  | 695 | 8 layers: TPMI=3 | |  |  |  |  |  |  | 696 | 1 layer: TPMI=32 | |  |  |  |  |  |  | 697-1023 | reserved |   **Table 7.3.1.1.2-5S: Precoding information and number of layers, for 8 antenna ports, if transform precoder is disabled, *maxRank* = 5, 6, 7, 8, *CodebookType=Codebook3,* and *ul-FullPowerTransmission* is configured to *fullpowerMode1***   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | Bit field mapped to index | *maxRank = 5* | Bit field mapped to index | *maxRank = 6* | Bit field mapped to index | *maxRank = 7* | Bit field mapped to index | *maxRank = 8* | | 0 | 1 layer: TPMI=0 | 0 | 1 layer: TPMI=0 | 0 | 1 layer: TPMI=0 | 0 | 1 layer: TPMI=0 | | … | … | … | … | … | … | … | … | | 15 | 1 layer: TPMI=15 | 15 | 1 layer: TPMI=15 | 15 | 1 layer: TPMI=15 | 15 | 1 layer: TPMI=15 | | 16 | 2 layers: TPMI=0 | 16 | 2 layers: TPMI=0 | 16 | 2 layers: TPMI=0 | 16 | 2 layers: TPMI=0 | | … | … | … | … | … | … | … | … | | 119 | 2 layers: TPMI=103 | 119 | 2 layers: TPMI=103 | 119 | 2 layers: TPMI=103 | 119 | 2 layers: TPMI=103 | | 120 | 3 layers: TPMI=0 | 120 | 3 layers: TPMI=0 | 120 | 3 layers: TPMI=0 | 120 | 3 layers: TPMI=0 | | … | … | … | … | … | … | … | … | | 423 | 3 layers: TPMI=303 | 423 | 3 layers: TPMI=303 | 423 | 3 layers: TPMI=303 | 423 | 3 layers: TPMI=303 | | 424 | 4 layers: TPMI=0 | 424 | 4 layers: TPMI=0 | 424 | 4 layers: TPMI=0 | 424 | 4 layers: TPMI=0 | | … | … | … | … | … | … | … | … | | 703 | 4 layers: TPMI=279 | 703 | 4 layers: TPMI=279 | 703 | 4 layers: TPMI=279 | 703 | 4 layers: TPMI=279 | | 704 | 5 layers: TPMI=0 | 704 | 5 layers: TPMI=0 | 704 | 5 layers: TPMI=0 | 704 | 5 layers: TPMI=0 | | … | … | … | … | … | … | … | … | | 863 | 5 layers: TPMI=159 | 863 | 5 layers: TPMI=159 | 863 | 5 layers: TPMI=159 | 863 | 5 layers: TPMI=159 | | 864 | 1 layer: TPMI=16 | 864 | 6 layers: TPMI=0 | 864 | 6 layers: TPMI=0 | 864 | 6 layers: TPMI=0 | | 865 | 2 layers: TPMI=104 | … | … | … | … | … | … | | 866 | 3 layers: TPMI=304 | 943 | 6 layers: TPMI=79 | 943 | 6 layers: TPMI=79 | 943 | 6 layers: TPMI=79 | | 867-1023 | reserved | 944 | 1 layer: TPMI=16 | 944 | 7 layers: TPMI=0 | 944 | 7 layers: TPMI=0 | |  |  | 945 | 2 layers: TPMI=104 | … | … | … | … | |  |  | 946 | 3 layers: TPMI=304 | 975 | 7 layers: TPMI=31 | 975 | 7 layers: TPMI=31 | |  |  | 944-1023 | reserved | 976 | 1 layer: TPMI=16 | 976 | 8 layers: TPMI=0 | |  |  |  |  | 977 | 2 layers: TPMI=104 | … | … | |  |  |  |  | 978 | 3 layers: TPMI=304 | 991 | 8 layers: TPMI=15 | |  |  |  |  | 979-1023 | reserved | 992 | 1 layer: TPMI=16 | |  |  |  |  |  |  | 993 | 2 layers: TPMI=104 | |  |  |  |  |  |  | 994 | 3 layers: TPMI=304 | |  |  |  |  |  |  | 995-1023 | reserved |   ===========================End of text proposal to TS 38.212===================== |

**Agreement**

Adopt the following TP to TS 38.212.

* Reason for change: The current specifications in 38.212 does not include details related to the SRS resource indicated for fullpowerMode2 with 8 antenna ports.
* Summary of change: Addition of a text related to indicated SRS resource for fullpowerMode2 with 8 antenna ports.
* Consequences if not approved: Not support of fullpowerMode2.

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| 7.3.1.1.2 Format 0\_1  <Unchanged parts omitted>  For the higher layer parameter *txConfig=codebook*, if *ul-FullPowerTransmission* is configured to *fullpowerMode2*, maxRank is configured to be larger than 2, and at least one SRS resource with 4 antenna ports or 8 antenna ports is configured in the SRS resource set indicated by SRS resource set indicator field if present, otherwise in an SRS resource set with usage set to 'codebook', and an SRS resource with 2 antenna ports is indicated via SRI in the same SRS resource set, then Table 7.3.1.1.2-4 is used.  For the higher layer parameter *txConfig=codebook*, if *ul-FullPowerTransmission* is configured to *fullpowerMode2*, *maxRank* is configured to be larger than 4, and at least one SRS resource with 8 antenna ports is configured in the SRS resource set ~~indicated by SRS resource set indicator field if present, otherwise in an SRS resource set~~ with usage set to 'codebook', and an SRS resource with 4 antenna ports is indicated via SRI in the same SRS resource set, then Table 7.3.1.1.2-2 is used.  <Unchanged parts omitted> |

**In RAN1#115, the following agreements were made.**

Multi-TRP enhancement

**Agreement**

Adopt the following text proposals to TS 38.212 V18.0.0 Section 7.3.1.2.2 and Section 7.3.1.2.3, and to TS 38.214 V18.0.0 Section 5.1.6.2:

* Reason for change: In S-DCI based MTRP operation, Rel-18 unified TCI extension uses different schemes (TCI selection field in the DCI, RRC configuration, or default rule) to select one or two indicated TCI states for PDSCH reception, rather than being based on legacy DCI field 'Transmission Configuration Indication' indicating one or two TCI states. Without a specification change, to switch to S-DCI based PDSCH Tx still only depends legacy condition (i.e., TCI field indicating two TCI states), thus S-DCI based PDSCH transmission would not work under Rel-18 unified TCI framework extension based on current specification.
* Summary of change: In S-DCI based MTRP operation, Rel-18 unified TCI extension uses different schemes (TCI selection field in the DCI, RRC configuration, or default rule) to select one or two indicated TCI states for PDSCH reception, rather than being based on legacy DCI field 'Transmission Configuration Indication' indicating one or two TCI states.
* Consequences if not approved: Incomplete and unclear specification of Rel-18 unified TCI extension

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| 5.1.6.2 DM-RS reception procedure  <Unchanged text omitted>  For DM-RS configuration enhanced type 1,   * if a UE is configured with the higher layer parameter repetitionScheme set to 'fdmSchemeA' or ‘fdmSchemeB’, and is indicated with two TCI states in a codepoint of the DCI field 'Transmission Configuration Indication' for the UE not configured with *dl-OrJointTCI-StateList ,*or is having two indicated TCI states to be applied to PDSCH for the UE configured with *dl-OrJointTCI-StateList*, and DM-RS port(s) within one CDM group in the DCI field 'Antenna Port(s)',   + if a UE is not indicating UE capability of [noSchedulingRestrictionForFDMSchemes-r18], the UE shall assume that the number of consecutively scheduled PRBs for PDSCH for each TCI-state is even, and the offset of each set of consecutively scheduled PRB from common resource block 0 for PDSCH for each TCI-state is even number. * otherwise,   + if the UE is not indicating UE capability of [noSchedulingRestriction-r18], the UE shall assume the number of consecutively scheduled PRBs for PDSCH is even, and the offset of each set of consecutively scheduled PRB for PDSCH from common resource block 0 is even number.   <Unchanged text omitted>  If at least one TCI codepoint indicates two TCI states for the UE not configured with *dl-OrJointTCI-StateList*, or if the UE configured with *dl-OrJointTCI-StateList* is having two indicated TCI states, and the UE receives the DM-RS for PDSCH and an SS/PBCH block in the same OFDM symbol(s), then the UE may assume that at least one DM-RS port for the PDSCH and SS/PBCH block are quasi co-located with 'QCL-TypeD', if 'QCL-TypeD' is applicable.  <Unchanged text omitted> |

**Agreement**

Adopt the following text proposals to TS 38.212 V18.0.0 Section 7.3.1.2.2 and Section 7.3.1.2.3:

* Reason for change: In S-DCI based MTRP operation, Rel-18 unified TCI extension uses different schemes (TCI selection field in the DCI, RRC configuration, or default rule) to select one or two indicated TCI states for PDSCH reception, rather than being based on legacy DCI field 'Transmission Configuration Indication' indicating one or two TCI states. Without a specification change, to switch to S-DCI based PDSCH Tx still only depends legacy condition (i.e., TCI field indicating two TCI states), thus S-DCI based PDSCH transmission would not work under Rel-18 unified TCI framework extension based on current specification.
* Summary of change: In S-DCI based MTRP operation, Rel-18 unified TCI extension uses different schemes (TCI selection field in the DCI, RRC configuration, or default rule) to select one or two indicated TCI states for PDSCH reception, rather than being based on legacy DCI field 'Transmission Configuration Indication' indicating one or two TCI states.
* Consequences if not approved: Incomplete and unclear specification of Rel-18 unified TCI extension

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| 7.3.1.2.2 Format 1\_1  <Unchanged text omitted>  - Antenna port(s) – 4, 5, 6, 7 or 8 bits as defined by Tables 7.3.1.2.2-1/2/3/4/7/8/9/10 and Tables 7.3.1.2.2-1A/2A/3A/4A/7A/8A/9A/10A, 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 7.3.1.2.2-1/2/3/4/7/8/9/10 or Tables 7.3.1.2.2-1A/2A/3A/4A/7A/8A/9A/10A. When a UE not configured with *dl-OrJointTCI-StateList* receives an activation command that maps at least one codepoint of DCI field '*Transmission Configuration Indication*' to two TCI states, or when a UE configured with *dl-OrJointTCI-StateList* is having two indicated TCI states, the UE shall use Table 7.3.1.2.2-1A/2A/3A/4A/7A/8A/9A/10A; otherwise, it shall use Tables 7.3.1.2.2-1/2/3/4/7/8/9/10. The UE can receive an entry with DMRS ports equals to 1000, 1002, 1003 when the UE is not configured with *dl-OrJointTCI-StateList* and two TCI states are indicated in a codepoint of DCI field '*Transmission Configuration Indication*', or when the UE configured with *dl-OrJointTCI-StateList* is having two indicated TCI states to be applied to PDSCH.  <Unchanged text omitted>  7.3.1.2.3 Format 1\_2  <Unchanged text omitted>  - Antenna port(s) – 0, 4, 5, 6, 7 or 8 bits  - 0 bit if higher layer parameter *antennaPortsFieldPresenceDCI-1-2* is notconfigured;  - Otherwise 4, 5, 6, 7 or 8 bits as defined by Tables 7.3.1.2.2-1/2/3/4/7/8/9/10 and Tables 7.3.1.2.2-1A/2A/3A/4A/7A/8A/9A/10A, 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 7.3.1.2.2-1/2/3/4/7/8/9/10 or Tables 7.3.1.2.2-1A/2A/3A/4A/7A/8A/9A/10A. When a UE not configured with *dl-OrJointTCI-StateList* receives an activation command that maps at least one codepoint of DCI field '*Transmission Configuration Indication*' to two TCI states, or when a UE configured with *dl-OrJointTCI-StateList* is having two indicated TCI states, the UE shall use Table 7.3.1.2.2-1A/2A/3A/4A/7A/8A/9A/10A; otherwise, it shall use Tables 7.3.1.2.2-1/2/3/4/7/8/9/10.  <Unchanged text omitted> |

**Agreement**

On unified TCI framework extension for S-DCI based MTRP operation, for PUSCH transmission scheduled/activated by DCI format 0\_1/0\_2 (including DG and Type2 CG), if only one SRS resource set is configured for CB/NCB (i.e., the SRS resource set indicator is not present in DCI format 0\_1/0\_2), an RRC configuration is provided to the UE to inform that the UE shall apply the first or the second indicated joint/UL TCI state to PUSCH transmission(s) scheduled/activated by DCI format 0\_1/0\_2

**Agreement**

Adopt the following text proposals to TS 38.213 V18.0.0 Section 6:

* Reason for change: Current specification in TS 38.213 V18.0.0 Section 6 for cell-specific BFR under unified TCI framework cannot extend to Rel-18 unified TCI extension where more than one unified TCI states are indicated
* Summary of change: Change current specification to include the case if more than one unified TCI states are indicated
* Consequences if not approved: Cell-specific BFR cannot be supported in Rel-18 unified TCI extension where more than one unified TCI states are indicated

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| 6 Link recovery procedures  <Unchanged part is omitted>  If a UE is provided *dl-OrJointTCI-StateList* or *ul-TCI-StateList* ~~indicating a unified TCI state~~ and is indicated with one or two TCI state(s) for the PCell or the PSCell [6, TS 38.214] associated with and , after 28 symbols from a last symbol of a first PDCCH reception in a search space set provided by *recoverySearchSpaceId* where the UE detects a DCI format with CRC scrambled by C-RNTI or MCS-C-RNTI, the UE  - if *SSB-MTC-AdditionalPCI* is not provided, monitors PDCCH in all CORESETs, and receives PDSCH and aperiodic CSI-RS resource in a CSI-RS resource set with same indicated TCI state as for the PDCCH and PDSCH, using the same antenna port quasi co-location parameters as the ones associated with the corresponding index , if any  - transmits PUSCH, PUCCH and SRS that uses a same spatial domain filter with same indicated TCI state as for the PUSCH and the PUCCH, using a same spatial domain filter as for the last PRACH transmission using the following parameters for determination of a corresponding power as described in clauses 7.1.1, 7.2.1, and 7.3.1  - the RS index for obtaining the downlink pathloss estimate  - the values of , , and the PUSCH power control adjustment state provided by *p0AlphaSetforPUSCH* associated with the smallest value of *ul-powercontrolId* for the PCell or the PSCell  - the value of and the PUCCH power control adjustment state provided by *p0AlphaSetforPUCCH* associated with the smallest value of *ul-powercontrolId* for the PCell or the PSCell  - the values of , , and the SRS power control adjustment state provided by *p0AlphaSetforSRS* associated with the smallest value of *ul-powercontrolId* for the PCell or the PSCell  <Unchanged part is omitted>  If a UE is provided *dl-OrJointTCI-StateList* or *ul-TCI-StateList* ~~indicating a unified TCI state~~ and is indicated with one or two TCI state(s) for the PCell or the PSCell associated with and , and the UE provides BFR MAC CE in Msg3 or MsgA of contention based random access procedure, after 28 symbols from the last symbol of the PDCCH reception that determines the completion of the contention based random access procedure as described in [11, TS 38.321], the UE  - if *SSB-MTC-AdditionalPCI* is not provided, monitors PDCCH in all CORESETs, and receives PDSCH and aperiodic CSI-RS resource in a CSI-RS resource set with same indicated TCI state as for the PDCCH and PDSCH using the same antenna port quasi co-location parameters as the ones associated with the corresponding index , if any  - transmits PUSCH, PUCCH and SRS that uses a same spatial domain filter with same indicated TCI state as for the PUSCH and PUCCH, using a same spatial domain filter as for the last PRACH transmission using the following parameters for determination of a corresponding power as described in clauses 7.1.1, 7.2.1, and 7.3.1  - the RS index for obtaining the downlink pathloss estimate  - the values of , , and the PUSCH power control adjustment state provided by *p0AlphaSetforPUSCH* associated with the smallest value of *ul-powercontrolId* for the PCell or the PSCell  - the value of and the PUCCH power control adjustment state provided by *p0AlphaSetforPUCCH* associated with the smallest value of *ul-powercontrolId* for the PCell or the PSCell  - the values of , , and the SRS power control adjustment state provided by *p0AlphaSetforSRS* associated with the smallest value of *ul-powercontrolId* for the PCell or the PSCell  <Unchanged part is omitted>  For serving cells associated with and , ~~If~~ if a UE is provided *dl-OrJointTCI-StateList* or *ul-TCI-StateList* ~~indicating a unified TCI state~~ and is indicated with one or two TCI state(s), after 28 symbols from a last symbol of a PDCCH reception with a DCI format scheduling a PUSCH transmission with a same HARQ process number as for the transmission of the first PUSCH and having a toggled NDI field value, the UE  - if *SSB-MTC-AdditionalPCI* is not provided, monitors PDCCH in all CORESETs, on the SCell (s) indicated by the MAC CE, and receives PDSCH and aperiodic CSI-RS resource in a CSI-RS resource set using the same antenna port quasi co-location parameters as the ones associated with the corresponding index , if any  - transmits PUSCH, PUCCH and SRS that uses a same spatial domain filter with same indicated TCI state as for the PUSCH and PUCCH, using a same spatial domain filter as the one corresponding to , if any, and using the following parameters for determination of a corresponding power as described in clauses 7.1.1, 7.2.1, and 7.3.1  - the RS index for obtaining the downlink pathloss estimate  - the values of , , and the PUSCH power control adjustment state provided by *p0AlphaSetforPUSCH* associated with the smallest value of *ul-powercontrolId* for the corresponding SCell  - the value of and the PUCCH power control adjustment state provided by *p0AlphaSetforPUCCH* associated with the smallest value of *ul-powercontrolId* for the corresponding SCell  - the values of , , and the SRS power control adjustment state provided by *p0AlphaSetforSRS* associated with the smallest value of *ul-powercontrolId* for the corresponding SCell  <Unchanged part is omitted> |

**Conclusion**

When a UE is configured with unified TCI framework extension for S-DCI based MTRP (i.e., when a UE is configured with *dl-OrJointTCI-StateList* and is having two indicated TCI states), it is an error case that the UE receives a MAC-CE used for TCI state activation in Rel-17 unified TCI framework

**Conclusion**

There is no consensus in RAN1 to support the report of P-MPR for unified TCI framework extension for S-DCI based MTRP, if twoPHRMode is configured, and two SRS resource sets for CB/NCB and multipanelScheme for SDM/SFN are configured

**Agreement**

Revert the following working assumption:

* *Working Assumption: A UE may report that it supports that the [activated] UL/joint TCI states [of UL signals/channels] associated to one CORESETPoolIndex correspond to both TAGs*

**Conclusion**

When a UE is configured with both the inter-cell multi-DCI based Multi-TRP operation with two TAs and Rel-18 LTM features, the UE does not expect the cell indicator field and PCI indicator field to be non-zero simultaneously.

* FFS: cell indicator field and PCI indicator field are not non-zero simultaneously
  + Including potential specification impact

**Agreement**

When PRACH is transmitted towards a TRP that is different from the TRP that transmits PDCCH order,

for multi-DCI based inter-cell multi-TRP and intra-cell multi-TRP operation with two TAGs configured in a CC, SSB indicated in the CFRA based PDCCH order is used as the PL-RS for determining the transmit power of the triggered PRACH transmission.

* UE expects the indicated SSB in PDCCH order to be configured as PL-RS of an activated TCI state

**Agreement**

For PUSCH scheduled by RAR, for inter-cell and intra-cell Multi-DCI Multi-TRP operation with two Tas, TAG indicated in RAR is applied.

**Agreement**

For PRACH or Msg.A transmission,for inter-cell Multi-DCI Multi-TRP operation with two TAs, first value and first DL reference timing are applied when PRACH is triggered towards serving cell PCI, second value and second DL reference timing are applied when PRACH is triggered towards active additional cell PCI.

**Agreement**

For intra-cell multi-DCI based Multi-TRP operation with two TA enhancement, introduce one bit field ‘PCI indicator’ for indicating cross-TRP triggering of PRACH by a PDCCH order:

* if the ‘PCI indicator’ field indicates 0, use legacy approach for determining PL-RS for determining PRACH transmit power.
* if the ‘PCI indicator’ field indicates 1, use SSB indicated in PDCCH order as PL-RS for determining PRACH transmit power.

For the determination of downlink reference timing for PRACH transmission, at least the same one bit will be reused. FFS details.

Editor to decide on the final name for the field ‘PCI indicator’

CSI enhancement

**Agreement**

For the Rel-18 Type-II codebook refinement for CJT mTRP, adopt the following TP for TS 38.214:

**Reason for change**: In the equation of for Further Enhanced Type II Port Selection codebook for CJT reports, the number of selected ports should be instead of . The is the number of selected ports for the *k*-th selected CSI-RS resource, while is the *k*-th gNB-configured CSI-RS resource. Using will result in a miscalculated priority value, when the combination is unequal.

**Summary of change**: Regarding the priority value for Further Enhanced Type II Port Selection codebook for CJT reports, and are changed to and respectively.

**Consequences if not approved**: The priority value may be miscalculated, which leads to a wrong behavior in UCI omission.

=============Start of Text Proposal to TS 38.214=============

For Further Enhanced Type II Port Selection for CJT reports, for a given CSI report , each reported element of and , indexed by , , and , is associated with a priority value , for , , and , and where is defined in Clause 5.2.2.2.8. The element with the highest priority has the lowest associated value . Omission of Part 2 CSI is according to the priority order shown in Table 5.2.3-1, where:

- Group 0 includes (if reported), () and (if reported).

- Group 1 includes the highest priority elements of (if reported), , the highest priority elements of , the highest priority elements of () and (if reported).

- Group 2 includes the lowest priority elements of (if reported), the lowest priority elements of and the lowest priority elements of ().

=============End of Text Proposal to TS 38.214=============

**Agreement**

For the Rel-18 Type-II codebook refinement for CJT mTRP, adopt the following TP for TS 38.214:

**Reason for change**: To capture the following agreement:

[114bis] **Agreement**:

For the Rel-18 Type-II codebook refinement for CJT mTRP, with respect to L or , the supported Parameter Combinations is enumerated for each NTRP value (up to 5 for Rel-16-based and 8 for Rel-17-based), rather than enumerating across all NTRP values of 1, 2, 3, and 4 (up to 17 for Rel-16-based and 20 for Rel-17-based).

* Note: in TS38.214, this affects Tables 5.2.2.2.8-1, 5.2.2.2.8-3, 5.2.2.2.9-1, and 5.2.2.2.9-3

**Summary of change**: Similar corrections on the text of the indices of *paramCombination-CJT-PS-alpha-r18* which UE is not expected to be configured with, should be applied to further enhanced Type-II port selection codebook for CJT in section 5.2.2.2.9 in TS 38.214.

**Consequences if not approved**: Agreement isn’t implemented and spec is faulty

<Unchanged part omitted>

- The UE is not expected to be configured with *paramCombination-CJT-PS-alpha-r18* equal to

- ~~2, 7, 10, 11 or 12~~ 2 for ; 4 for 2; 2, 3 or 4 for 3, when ,

- ~~3, 8, 16 or 20~~ 3 for ; 5 for 2; 8 for 3; or 4 for 4, when *paramCombination-CJT-PS-r18* is configured to 4 or 5 and ,

- ~~1, 4, 5, 6, 9, 10, 11, 12, 13, 14, 15, 17, 18 or 19~~ 1 for ; 1, 2, 3 for 2; 1, 2, 3, 4, 5, 6, 7 for 3; 1, 2 or 3 for 4, when and higher layer parameter t*ypeII-CJT-PS-RI-Restriction-r18* is configured with for any .

<Unchanged part omitted>

**Agreement**

For the Rel-18 Type-II codebook refinement for CJT mTRP, adopt the following TP for TS 38.214:

---------------------**Start TP for 38.214** ---------------------------------------------

5.2.2.2.9 Further enhanced Type II port selection codebook for CJT

For 4 antenna ports {3000, 3001, …, 3003}, 8 antenna ports {3000, 3001, …, 3007}, 12 antenna ports {3000, 3001, …, 3011}, 16 antenna ports {3000, 3001, …, 3015}, 24 antenna ports {3000, 3001, …, 3023}, and 32 antenna ports {3000, 3001, …, 3031} per CSI-RS resource, the UE configured with CSI-RS resources in a resource set for channel measurement and with higher layer parameter *codebookType* set to 'typeII-CJT-PortSelection-r18'

- the number of CSI-RS ports for each CSI-RS resource, , is configured as in clause 5.2.2.2.4.

*--- unrelated text omitted ---*

The value of is configured with the higher-layer parameter *valueOfN-CJT-r18*, when .

*--- unrelated text omitted ---*

If the higher layer parameter *codebookMode* is set to 'mode1', an offset is reported for the -th selected CSI-RS resource, with , relative to the first of the selected CSI-RS resources. The reported offsets are common for all layers and are indicated by , given by

*--- unrelated text omitted ---*

*--------------------*End of TPfor 38.214 ----------------------------------------

**Agreement**

For the Rel-18 Type-II codebook refinement for CJT mTRP, adopt the following TP for TS 38.214 section 5.2.3:

---------------------**Start TP for 38.214** ---------------------------------------------

For Enhanced Type II for CJT reports, for a given CSI report , each reported element of and , indexed by , and , is associated with a priority value , with , for , , and , and where and are defined in Clause 5.2.2.2.8. The element with the highest priority has the lowest associated value . Omission of Part 2 CSI is according to the priority order shown in Table 5.2.3-1, where

- Group 0 includes indices (if reported), (if reported) and ().

- Group 1 includes indices (if reported), (if reported), the highest priority elements of , , the highest priority elements of , the highest priority elements of () and (if reported).

- Group 2 includes the lowest priority elements of , the lowest priority elements of and the lowest priority elements of ().

- For Further Enhanced Type II Port Selection for CJT reports, for a given CSI report , each reported element of and , indexed by , , and , is associated with a priority value , for , , and , and where is defined in Clause 5.2.2.2.8. The element with the highest priority has the lowest associated value . Omission of Part 2 CSI is according to the priority order shown in Table 5.2.3-1, where:

- Group 0 includes (if reported), () and (if reported).

- Group 1 includes the highest priority elements of (if reported), , the highest priority elements of , the highest priority elements of () and (if reported).

- Group 2 includes the lowest priority elements of (if reported), the lowest priority elements of and the lowest priority elements of ().

*--------------------*End of TPfor 38.214 ----------------------------------------

**Agreement**

For the Rel-18 Type-II codebook refinement for CJT mTRP, change to in Table 6.3.2.1.2-1B and Table 6.3.2.1.2-2C of TS 38.212

**Agreement**

For the Type-II codebook refinement for high/medium velocities, in TS 38.212 section 6.3.2.1.2 Table 6.3.2.1.2-5F, replace “Pri(l,i,f,q)” to “Pri(l,i,f) for N4 = 1 or Pri(l,i,f,j) for N4 > 1”

* This is needed to align the notation with TS 38.214

**Agreement**

For the Type-II codebook refinement for high/medium velocities, adopt the following TP for TS 38.214:

**Reason for change:**

[114bis] **Agreement**

For the Type-II codebook refinement for high/medium velocities, regarding CPU allocation, remove Y=2/3 (previously agreed) and add the support for OCPU=8 for K=12 for AP-CSIRS

Furthermore, for Rel-18 CJT CSI, the number of CPU is , where is reported by UE capability indication. When , the value can be 4.5 based on the reported value. A ceil operation is expected here.

***Summary of change:*** Delete Y=2/3 for P/SP CSI-RS based doppler CSI reporting, and add ceil operation for CPU calculation of CJT CSI.

***Consequences if not approved:*** The agreement could not be captured for doppler CSI reporting, and the number of CPU for CJT CSI can be a non-integer.

5.2.1.6 CSI processing criteria

- for a CSI report with *CSI-ReportConfig* with higher layer parameter *reportQuantity* set to ‘cri-RI-PMI-CQI’, ‘cri-RI-i1’, ‘cri-RI-i1-CQI’, ‘cri-RI-CQI’, or ‘cri-RI-LI-PMI-CQI’,

- …

- if a *CSI-ReportConfig* is configured with the higher layer parameter *reportQuantity* set to ‘cri-RI-PMI-CQI’, *codebookType* set to ‘typeII-CJT-r18’ or ‘typeII-CJT-PortSelection-r18’ and the corresponding *NZP-CSI-RS-ResourceSet* for channel measurement is configured with resources, , where is reported by UE capability indication,

- …

- if the corresponding CSI-RS Resource Set for channel measurement is periodic or semi-persistent and configured with a single CSI-RS resource, for and , for , where the value of is configured by the higher layer parameter *N4*, and is reported by UE capability indication,

**Agreement**

For the Rel-18 TRS-based TDCP reporting, clarify, in TS 38.212 section 6.3.2.1.2 Table 6.3.2.1.2-3C, that:

* the UE reports the TDCP based on the order of the first configured delay D\_1 to the last configured delay D\_Y
* the UE always reports at least one amplitude value

**Agreement**

For the Rel-18 TRS-based TDCP reporting, in relation to the following text in TS 38.331, send an LS to RAN2 that the *nzp-CSI-RS-ResourceSetList* in *CSI-ResourceConfig* can be configured with up to 3 periodic CSI-RS resource set for TDCP report:

***nzp-CSI-RS-ResourceSetList***

List of references to NZP CSI-RS resources used for beam measurement and reporting in a CSI-RS resource set.

If *resourceType* is set to ‘aperiodic’, the network configures up to *maxNrofNZP-CSI-RS-ResourceSetsPerConfig* resource sets. If resourceType is is set to ‘periodic’ or ‘semiPersistent’ and groupBasedBeamReporting-v1710 is not configured in IE CSI-ReportConfig, the network configures 1 resource set. If resourceType is set to ‘periodic’ or ‘semiPersistent’ and groupBasedBeamReporting-v1710 is configured, the network configures 2 resource sets, which may be two NZP CSI-RS resource sets, two CSI SSB resource sets or one NZP CSI-RS resource set and one CSI-SSB resource set (see TS 38.214 [19], clause 5.2.1.2 and 5.2.1.4.2). In this case, in TS 38.212 [17] Table 6.3.1.1.2-8B, the following applies:

- if the list has one NZP CSI-RS resource set, this resource set is indicated by a resource set indicator set to 0;

- if the list has two NZP CSI-RS resource sets, the first resource set is indicated by a resource set indicator set to 0 and the second resource set by a resource set indicator set to 1.

Final LS in R1-2312382.

**Agreement**

For the Rel-18 Type-II codebook refinement for CJT mTRP, adopt the following TP for TS 38.214:

**Reason for change:**

[112bis-e] **Agreement**

For the Rel-18 Type-II codebook refinement for high/medium velocities, regarding CSI calculation and measurement,

* The number of CSI-RS ports is the same for all the K configured CSI-RS resources comprising the CMR and the antenna ports for the same antenna port index across the K CSI-RS resources are the same.
* All the K configured CSI-RS resources comprising the CMR share the same BW and RE locations
* For interference measurement, legacy specification is fully reused, including the configuration for NZP CSI-RS for interference measurement or CSI-IM in relation to the configured CMR, i.e. only one NZP CSI-RS resource for interference measurement or only one CSI-IM resource can be configured irrespective of the value of K

……

**Conclusion** (RAN1#112bis-e) [Rel18-CJT]

For the Rel-18 Type-II codebook refinement for CJT mTRP, regarding interference measurement, beyond that supported in legacy specification, there is no consensus on supporting any additional enhancement on IMR (including the configuration for NZP CSI-RS for interference measurement or CSI-IM in relation to the configured CMR(s)).

* Note: This implies that only one NZP CSI-RS resource for interference measurement or only one CSI-IM resource can be configured irrespective of the value of NTRP

**Summary of change:** added a list of relevant reportQuantity types

**Consequence if not approved**: (according to the proponent) agreement and conclusion aren’t explicitly captured.

---------------------**Start TP for 38.214** ---------------------------------------------

5.2.1.4.1 Resource Setting configuration

<Unchanged text is omitted>

Except for L1-SINR, *codebookType* set to 'typeII-CJT-r18', 'typeII-CJT-PortSelection-r18', 'typeII-Doppler-r18', or 'typeII-Doppler-PortSelection-r18', if interference measurement is performed on NZP CSI-RS, a UE does not expect to be configured with more than one NZP CSI-RS resource in the associated resource set within the resource setting for channel measurement. Except for L1-SINR, the UE configured with the higher layer parameter *nzp-CSI-RS-ResourcesForInterference* may expect no more than 18 NZP CSI-RS ports configured in a NZP CSI-RS resource set.

<Unchanged text is omitted>

---------------------**End TP for 38.214** ---------------------------------------------

**Agreement**

For the Type-II codebook refinement for high/medium velocities, when a UE is configured with K(=4,8, or 12) AP-CSI-RS resources for CMR, clarify that the CSI-RS resources are transmitted following the order of the CSI-RS resource IDs configured in the CSI-RS Resource Set.

**Agreement**

For the Type-II codebook refinement for high/medium velocities, for SP-CSI on PUSCH, CPU occupation duration is determined by the first symbol of KP-th latest consecutive P/SP-CSI-RS occasions no later than CSI reference resource.

* FFS (RAN1#116): CPU occupation duration in relation to interference measurement resource

**Agreement**

For the Rel-18 TRS-based TDCP reporting, adopt the following TP for TS 38.214:

**Reason for change:** There is no agreement to support KTRS=1 with aperiodic TRS regardless of the interpretation of the previous conclusions (below)

[113] **Conclusion**

For the Rel-18 TRS-based TDCP reporting, for TDCP measurement and calculation, there is no consensus on supporting the following: joint use of P and AP-TRS resource sets for TDCP measurement and calculation is supported at least for Y=1 as a UE-optional feature

[114] **Conclusion**:

For the Rel-18 TRS-based TDCP reporting, there is no consensus on supporting the following proposals:

* additional D value(s)
* TRS resource configuration where all the configured KTRS resource sets are aperiodic
* …

**Summary of change:** Delete the description on supporting AP TRS set only for TDCP measurement.

**Consequences if not approved:** AP TRS only for TDCP measurement, which was not agreed in RAN1, is specified in RAN1 specification.

**5.2.1.2 Resource settings**

<omitted part>

For TDCP measurement, one ~~aperiodic or~~ periodic CSI Resource Setting is configured, and the Resource Setting is for channel measurement on CSI-RS for tracking.

<omitted part>

**5.2.1.4.1 Resource Setting configuration**

<omitted part>

For aperiodic CSI, a UE configured with a CSI-ReportConfig with the higher layer parameter reportQuantity set to ‘tdcp’ is expected to be configured with one CSI Resource Setting (given by higher layer parameter resourcesForChannelMeasurement). The CSI Resource Setting can be configured with trs-Info and they may be periodic, with K\_TRS≥1 CSI-RS Resource Sets ~~or aperiodic, with a single CSI-RS Resource Set~~. For a periodic CSI-ResourceConfig, the UE can assume that all K\_TRS CSI-RS Resource Sets share the same QCL-TypeA/C and, if applicable, TypeD. The UE expects that all the CSI-RS resources in the CSI-RS Resource Set(s) are configured with the same bandwidth and subcarrier locations.

<omitted part>

**Agreement**

For the Rel-18 TRS-based TDCP reporting, adopt the following TP for TS 38.214:

* Per legacy specification, UE behavior on TRS reception is not defined outside DRX active time:

**Reason for change:** To address FFS in the previous agreement

[114bis] **Agreement**

For the Rel-18 TRS-based TDCP reporting, the UE reports a CSI report only if receiving at least one CSI-RS transmission occasion for each CSI-RS resource for KTRS CSI-RS resource sets configured for TDCP reporting no later than CSI reference resource, otherwise drops the report.

* This includes the cases of CSI report (re)configuration, serving cell activation, BWP change
  + FFS (RAN1#115): Whether DRX configuration needs to be included as a case

**Summary of change:** Added DRX as a case

**Consequences if not approved:** TDCP calculation may result in increased buffering if at least one of the CSI-RS occasions needed for a complete TDCP calculation is not present in a particular DRX active time

**2.2.5 CSI reference resource definition**

<Unchanged part omitted>

For a *CSI-ReportConfig* configured with the higher layer parameter *reportQuantity* set to ‘tdcp’, after the CSI report (re)configuration, serving cell activation, BWP change, the UE reports a CSI report only ~~after~~ if receiving at least one CSI-RS transmission occasion for each CSI-RS resource in the CSI-RS Resource Sets of the CSI-RS Resource Setting for channel measurement no later than the CSI reference resource within the same DRX active time, when DRX is configured, and drop the report otherwise.

<Unchanged part omitted>

Reference signal enhancement

**Agreement**

Adopt the following TP for TS 38.214 v18.0.0.

* Reason for change: Agreed TP (FL Proposal 2.2B in R1-2310278) is captured with [] in TS38.214.
* Summary of change: Capture the agreed TP of FL Proposal 2.2B in R1-2310278.
* Consequence if not approved: The spec does not capture the agreement.

|  |
| --- |
| 5.1.6.2 DM-RS reception procedure  < Unchanged parts are omitted >  ~~[~~When the UE is configured with the higher layer parameter *enhanced-dmrs-Type\_r18* and indicated with at least one DM-RS ports 1008-1015 for enhanced Type 1 DM-RS or DM-RS ports 1012-1023 for enhanced Type 2 DM-RS, the UE does not expect that any co-scheduled UE(s) in the same CDM group is not configured with the higher layer- parameter *enhanced-dmrs-Type\_r18*. When the UE is not configured with the higher layer parameter *enhanced-dmrs-Type\_18*, the UE does not expect that any co-scheduled UE(s) in the same CDM group(s) is configured with the higher layer parameter *enhanced-dmrs-Type\_r18* and indicated with at least one of DMRS ports 1008-1015 for enhanced Type 1 DMRS or DMRS ports 1012-1023 for enhanced Type 2 DMRS.~~]~~  < Unchanged parts are omitted > |

**Agreement**

Adopt the following TP for TS 38.214 v18.0.0.

* Reason for change: In RAN1 #114bis, it was agreed that introduce a UE feature group to indicate whether/how to support Rel-18 DMRS and PDSCH processing capability 2 simultaneously. And, in this feature group, the UE can additionally report relaxation on processing delay for PDSCH processing capability 2. When UE report the relaxation on processing delay, it should be used for calculating PDSCH processing delay.
* Summary of change: New processing delay parameter *d3* added into the equation of processing delay calculation, and description added.
* Consequence if not approved: Relaxation of the processing delay agreed cannot be supported.

Note: Candidate values of *d3* at least include 0, and other value(s) will be decided in UE feature session.

|  |
| --- |
| 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.  *- 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 regardless of whether or not the PDSCH reception provides a transport block for a HARQ process with disabled HARQ-ACK information as indicated by *HARQ-feedbackEnabling-disablingperHARQprocess*, if provided, and κ is defined in clause 4.1 of [4, TS 38.211].  - For UE processing capability 2,   * if the UE is not indicating [*UE Capability name*], the UE is not expected to be simultaneously configured with higher layer parameter *processingType2Enabled* set to ‘enable’ and higher layer parameter *enhanced-dmrs-Type\_r18*, and the additional processing delay *d3* is 0. * if the UE is indicating [*UE Capability name*], * if the UE is configured with higher layer parameter *enhanced-dmrs-Type\_r18,* the additional processing delay *d3* is indicated by [*UE Capability name*]. * Otherwise *d3* =0.   *-* For operation with shared spectrum channel access in FR1, is calculated according to [4, TS 38.211], otherwise =0.  < Unchanged parts are omitted > |

**Agreement**

* For two PTRS ports for partial-/non-coherent PUSCH, support to determine the time density of both PTRS ports by the relationship between the higher MCS of associated CW and configured thresholds.
* Adopt the following TP for TS 38.214 v18.0.0.
  + Reason for change: Based on the current spec., the time density of two PTRS ports can be different, which is unfriendly to UE implementation and should be avoided.
  + Summary of change: The time density of two PTRS ports is determined based on the higher one of the MCSs of two codewords.
  + Consequence if not approved: It causes unnecessary UE implementation complexity.

Note: This agreement reverts an existing RAN1 agreement

|  |
| --- |
| 6.2.3.1 UE PT-RS transmission procedure when transform precoding is not enabled  < Unchanged parts are omitted >  When a UE is scheduled to transmit PUSCH with allocation duration of 2 symbols or less, and if *LPT-RS* is set to 2 or 4, the UE shall not transmit PT-RS. When a UE is scheduled to transmit PUSCH with allocation duration of 4 symbols or less, and if *LPT-RS* is set to 4, the UE shall not transmit PT-RS.  When a UE is scheduled to transmit PUSCH for retransmission, if the UE is scheduled with *IMCS* > *V*, where *V* = 28 for MCS Table 5.1.3.1-1 and MCS Table 5.1.3.1-3 and *V* = 27 for MCS Table 5.1.3.1-2, respectively, the MCS for PT-RS time-density determination is obtained from the DCI for the same transport block in the initial transmission, which is smaller than or equal to V.  If a UE is configured with the higher layer parameter *maxNrofPorts* in *PTRS-UplinkConfig* set to 'n2' and scheduled with two codewords, the PT-RS time-density for both PTRS ports is determined based on the higher MCSs of two codewords associated with the initial transmission.  < Unchanged parts are omitted > |

FL note: the above reverts the following RAN1#113 agreement.

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| **Agreement**  For time density of PTRS of rank 5-8 PUSCH, support Alt.1:   * Alt.1: Reuse the existing RRC parameter of *timeDensity* in *PTRS-UplinkConfig* for both CWs.   The time density for an PTRS port is determined by the MCS for the associated CW |

**Agreement**

The following TPs in [R1-2312267](../Docs/R1-2312267.zip) are agreed for the editor’s CR.

* FL Proposal 4.1A
* FL Proposal 4.2A
* FL Proposal 4.2B
* FL Proposal 4.3A
* FL Proposal 4.4A
* FL Proposal 4.5A
* FL Proposal 4.6A
* FL Proposal 4.7A
* FL Proposal 4.7B

**Agreement**

* In TS 38.212, Table 7.3.1.2.2-8, Table 7.3.1.2.2-8A, Table 7.3.1.2.2-10, Table 7.3.1.2.2-10A are updated to move rows with “Number of front-load symbols”=1 (except the special rows for M-TRP in Table 7.3.1.2.2-8A and Table 7.3.1.2.2-10A) towards the beginning of the table.
* Adopt the TP in Proposal 1 in [R1-2312028](../Docs/R1-2312028.zip) for TS 38.212 v18.0.0.
* Adopt the TP in Proposal 2 in [R1-2312028](../Docs/R1-2312028.zip) for TS 38.214 v18.0.0.
  + **Reason for change:** In Rel.15, the row indices and contents of the *maxLength*=1 table is exactly the same as the first subset of rows in *maxLength*=2 table, which is nested structure. However, this principle is not inherited to the current TS38.212, and UE is required to memorize two tables. It requires extra complexity to manage the two tables and the load/reload of tables from DDR to (on chip) memory requires extra time which eat into UE’s already tight DMRS processing timeline.
  + **Summary for change:** Change ordering of indexes in Table 7.3.1.2.2-8, Table 7.3.1.2.2-8A, Table 7.3.1.2.2-10, and Table 7.3.1.2.2-10A.
  + **Consequences if not approved:** It requires extra complexity for UE implementation.

**Agreement**

Support joint configuration of Rel.18 DMRS ports and Rel.18 dynamic switching between DFT-S-OFDM and CP-OFDM for PUSCH.

* If UE is configured with the higher layer parameter *enhanced-dmrs-Type\_r18* in *DMRS-UplinkConfig*, and if the transform precoding enabled is indicated by the scheduling DCI, the UE ignores the configuration of the higher layer parameter *enhanced-dmrs-Type\_r18* in *DMRS-UplinkConfig*.
* Introduce new UE capability to indicate whether to support joint configuration of Rel.18 DMRS ports and Rel.18 dynamic switching between DFT-S-OFDM and CP-OFDM for PUSCH.

Adopt the following text proposal in TS38.214 v18.0.0.

* **Reason for change:** If UE is configured with both Rel.18 DMRS ports and the dynamic waveform switching for PUSCH, and if the scheduling DCI indicates DFT-S-OFDM, DMRS Type of the scheduled PUSCH is not clear.
* **Summary of change:** In the above case, UE ignores *enhanced-dmrs-Type\_r18* in *DMRS-UplinkConfig*.
* **Consequence if not approved:** In the above case, UE behaviour is undefined.

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| **6.1.3 UE procedure for applying transform precoding on PUSCH**  <Unchanged part omitted>  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 [*dynamicTransformPrecoderIndicationDCI-0-1]* in *pusch-Config* for DCI format 0\_1 or [*dynamicTransformPrecoderIndicationDCI-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 the UE is configured with the higher layer parameter *enhanced-dmrs-Type-r18* in *DMRS-UplinkConfig*, and if the scheduling grant indicates the transform precoding is enabled for the scheduled PUSCH transmission, the UE ignores the higher layer parameters [*enhanced-dmrs-Type\_r18*] in *DMRS-UplinkConfig*, if configured, for the DMRS 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*.  For PUSCH transmission with a configured grant  - If the UE is configured with the higher layer parameter *transformPrecoder* in *configuredGrantConfig*, 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 *configuredGrantConfig*, the UE shall, for this PUSCH transmission, consider the transform precoding either enabled or disabled according to the higher layer configured parameter *msg3-transformPrecoder*. |

**Agreement**

Support to report downgrading configuration(s) for UE supporting 8T8R (t8r8) configuration.

* Details to be decided in UE features design.

**Agreement**

Adopt the text proposal for TS38.214 on TDM:

**6.2.1 UE sounding procedure**

< Unchanged text is omitted>

- Support of time division mapping subsets of ports of the SRS resource into *S* symbols (*S=2)*, as defined by the higher layer parameter [*tdm*], where the SRS ports are evenly distributed in two consecutive symbols over the symbols in a slot for the SRS resource according to [4, TS 38.211] clause 6.4.1.4.2. This applies when the SRS resource set is configured with higher layer parameter *usage* in *SRS-ResourceSet* set to ‘*codebook*’, or ‘*antennaSwitching*’, and *nrofSRS-Ports* is set to ‘*n8*’.

< Unchanged text is omitted>

* Additional information
  + Reason for change: Insufficient description on TDM.
  + Summary for change: Add more description on TDM and reference to TS38.211.
  + Consequences if not approved: Unclear specification for SRS TDM.
  + TP is for TS38.214 v18.0.0.

**Agreement**

Adopt the text proposal for TS38.211 on comb offset hopping symbol indexing notation corrections:

**6.4.1.4.3 Mapping to physical resources**

< Unchanged text is omitted>

The frequency-domain starting position is defined by

where

< Unchanged text is omitted>

The quantity is given by

- if the higher-layer parameter *combOffsetHopping* is not configured:

- if the higher-layer parameter *combOffsetHopping* is configured:

< Unchanged text is omitted>

* Additional information
  + Reason for change: Symbol indexing notation not updated in some places.
  + Summary for change: Update the indexing from to .
  + Consequences if not approved: Incorrect specification for comb offset hopping equation.
  + TP is for TS38.211 v18.0.0.

**Agreement**

Adopt the following text proposal for clause 6.4.1.4.3 in TS 38.211.

**6.4.1.4.3 Mapping to physical resources**

< Unchanged text is omitted>

The pseudo-random sequence is defined by clause 5.2.1 and shall be initialized with at the beginning of each radio frame for which , where the comb offset hopping identity is contained in the higher-layer parameter *combOffsetHopping*.

< Unchanged text is omitted>

* Additional information
  + Reason for change: Editorial error.
  + Summary for change: Editorial correction.
  + Consequences if not approved: Incorrectly referring to “comb offset hopping” as “comb hopping”.
  + TP is for TS38.211 v18.0.0.

**Agreement**

Adopt the text proposal for TS38.211 on comb offset hopping and TDM UE assumption:

**6.2.1 UE sounding procedure**

< Unchanged text is omitted>

- Transmission comb offset, as defined by the higher layer parameter *combOffset-n2*, *combOffset-n4,* and *combOffset-n8* for transmission comb value 2, 4, or 8, and described in clause 6.4.1.4 of [4, TS 38.211]. When comb offset hopping is configured by the higher layer parameter [*combOffsetHopping*] for an SRS resource in an SRS resource set with the usage configured as '*antennaSwitching*' or ‘codebook’, subject to UE capabilities, transmission comb offset(s) are updated as described in [clause 6,4,1,4 of [4, TS 38.211]]. For the comb offset hopping, a UE can be configured with a subset of comb offsets by the higher layer parameter [c*ombOffsetHoppingSubset*], where the comb offset hopping is performed only across the comb offsets configured in the subset. The UE is not expecting that the comb offset hopping and the higher layer parameter [*tdm*] are configured simultaneously for an SRS resource.

< Unchanged text is omitted>

* Additional information
  + Reason for change: Comb offset hopping and TDM cannot be configured simultaneously per SRS resource instead of per UE.
  + Summary for change: Add “for an SRS resource” restriction.
  + Consequences if not approved: Confusion on whether the restriction is per UE or per SRS resource.
  + TP is for TS38.211 v18.0.0.

**Agreement**

Adopt the text proposal for TS38.214 on divisibility of *Ns* by *S\*R*:

**6.2.1 UE sounding procedure**

< Unchanged text is omitted>

The UE may be configured by the higher layer parameter *resourceMapping* in *SRS-Resource* with an SRS resource occupying  adjacent OFDM symbols within the last 6 symbols of the slot, or at any symbol location within the slot if *resourceMapping-r16* is provided subject to UE capability, where all antenna ports of the SRS resources are mapped to each symbol of the resource. When the SRS is configured with the higher layer parameter *SRS-PosResourceSet* the higher layer parameter *resourceMapping-r16* in *SRS-PosResource* indicates an SRS resource occupying adjacent symbols anywhere within the slot. When the SRS is configured with the higher layer parameter *SRS-ResourceSet,* the higher layer parameter *resourceMapping-r17* in *SRS-Resource* indicates an SRS resource occupying adjacent symbols anywhere within the slot. is divisible by , where the quantity when [*tdm*] is configured and otherwise, and the quantity *R* is the repetition factor.

< Unchanged text is omitted>

* Additional information
  + Reason for change: Current specification does not explicitly describe divisibility of *Ns* by *S\*R*.
  + Summary for change: Add description of divisibility of *Ns* by *S\*R*.
  + Consequences if not approved: Unclear specification.
  + TP is for TS38.214 v18.0.0.

**Agreement**

Adopt the text proposal for TS38.214:

6.2.1 UE sounding procedure

<Unchanged text is omitted>

For a SRS resource, if the higher layer parameters [*tdm*] or [combOffsetHopping] are configured, the corresponding UE SRS frequency hopping procedure is specified in clause 6.4.1.4.3 of [4, TS 38.211]. If for a SRS resource the higher layer parameters [*tdm*] and [combOffsetHopping] are not configured, the UE SRS frequency hopping procedure is specified in clause 6.4.1.4.3 of [4, TS 38.211] and in clause 6.2.1.~~2~~1.

<Unchanged text is omitted>

* Additional information
  + Reason for change: Incorrect reference to clause number.
  + Summary for change: Correct from “clause 6.2.1.2” to be “clause 6.2.1.1”.
  + Consequences if not approved: Incorrect specification for SRS.
  + TP is for TS38.214 v18.0.0.

**Agreement**

Adopt the text proposal for TS38.211 on repetition factor and TDM:

**6.4.1.4.3 Mapping to physical resources**

< Unchanged text is omitted>

If , frequency hopping is enabled and the frequency position indices are defined by

where is given by Table 6.4.1.4.3-1,



and where regardless of the value of . The quantity counts the number of SRS transmissions. For the case of an SRS resource configured as aperiodic by the higher-layer parameter *resourceType*, it is given by within the slot in which the symbol SRS resource is transmitted. The quantity is given by if the higher-layer parameter *nrofSRS-Ports-n8* equals ‘ports8tdm’, otherwise . The quantity is the repetition factor given by the field *repetitionFactor* if configured, otherwise .

< Unchanged text is omitted>

* Additional information
  + Reason for change: Current description of repetition factor does not cover TDM case.
  + Summary for change: Replace ‘’ with ‘’.
  + Consequences if not approved: Incorrect specification of repetition factor for TDM.
  + TP is for TS38.211 v18.0.0.

**Agreement**

Introduce a new UE capability *srs-AntennaSwitching2SP-1Periodic8T8R to extend srs-AntennaSwitching2SP-1Periodic to the case of 8T8R*

**Agreement**

Adopt the text proposal for TS38.214 on 8T8R UE capability:

**6.2.1.2 UE sounding procedure for DL CSI acquisition**

When the UE is configured with the higher layer parameter *usage* in *SRS-ResourceSet* set as 'antennaSwitching', the UE may be configured with only one of the following configurations depending on the indicated UE capability *supportedSRS-TxPortSwitch* ('t1r2' for 1T2R, 't1r1-t1r2' for 1T=1R/1T2R, 't2r4' for 2T4R, 't1r4' for 1T4R, ~~'t8r8' for 8T8R,~~ 't1r1-t1r2-t1r4' for 1T=1R/1T2R/1T4R, 't1r4-t2r4' for 1T4R/2T4R, 't1r1-t1r2-t2r2-t2r4' for 1T=1R/1T2R/2T=2R/2T4R, 't1r1-t1r2-t2r2-t1r4-t2r4' for 1T=1R/1T2R/2T=2R/1T4R/2T4R, 't1r1' for 1T=1R, 't2r2' for 2T=2R, 't1r1-t2r2' for 1T=1R/2T=2R, 't4r4' for 4T=4R, or 't1r1-t2r2-t4r4' for 1T=1R/2T=2R/4T=4R) or the UE may be configured with only one of the following configurations depending on the indicated UE capability *supportedSRS-TxPortSwitchBeyond4Rx* ('t1r1' for 1T=1R, 't2r2' for 2T=2R, 't1r2' for 1T2R, 't4r4' for 4T=4R, 't2r4' for 2T4R, 't1r4' for 1T4R, 't2r6' for 2T6R, 't1r6' for 1T6R, 't4r8' for 4T8R, 't2r8' for 2T8R, 't1r8' for 1T8R) or the UE may be configured with the following configurations depending on the indicated UE capability [*newUECapabilitySupporting8T8R*]:

* Additional information
  + Reason for change: New UE capability is introduced for 8T8R support.
  + Summary for change: Remove 8T8R from existing description. Add a description of new UE capability for 8T8R.
  + Consequences if not approved: Incorrect/incomplete specification for 8T8R.
  + TP is for TS38.214 v18.0.0.

Enhanced uplink transmission

**Agreement**

For a single-DCI based STxMP SDM PUSCH, the power scaling factor for each PT-RS port is determined according to the number of associated layers and the following table:

* Alt4: when = 1 or 2:

|  |  |  |  |
| --- | --- | --- | --- |
| *ptrs-Power* | The number of PUSCH layers associated with the PTRS port | | |
| 1 | 2 | |
| All cases | Full coherent | Partial and non-coherent and non-codebook based |
| 00 | 3Qp-3 | 3Qp | 3Qp-3 |
| 01 | 3Qp-3 | 3Qp | 3Qp |

**Agreement**

Adopt the following TP for 38.214:

* Reason for change: In the current specification, the restriction of in-order scheduling of PUSCH is applied to STxMP PUSCH+PUSCH in multi-DCI based system, which is not correct.
* Summary of change: Add text to exclude the STxMP PUSCH+PUSCH case from the description of restriction of in-order scheduling of PUSCH.
* Consequences if not approved: the overlapping PUSCHs in STxMP PUSCH+PUSCH cannot be scheduled:

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| TS38.214:  6.1 UE procedure for transmitting the physical uplink shared channel  < Unchanged parts are omitted >  A UE shall upon detection of a PDCCH with a configured DCI format 0\_0, 0\_1, 0\_2 or 0\_3 transmit the corresponding PUSCH as indicated by that DCI unless the UE does not generate a transport block as described in [10, TS38.321]. Upon detection of a DCI format 0\_1 or 0\_2 with '*UL-SCH indicator*' set to '0' and with a non-zero '*CSI request*' where the associated *reportQuantity* in *CSI-ReportConfig* set to '*none*' for all CSI report(s) triggered by '*CSI request*' in this DCI format 0\_1 or 0\_2, the UE ignores all fields in this DCI except the '*CSI request*' and the UE shall not transmit the corresponding PUSCH as indicated by this DCI format 0\_1 or 0\_2. Upon detection of a DCI format 0\_3 with '*UL-SCH indicator*' set to '0' and with a non-zero '*CSI request*' where the associated *reportQuantity* in *CSI-ReportConfig* set to '*none*' for all CSI report(s) triggered by '*CSI request*' in this DCI format 0\_3, the UE ignores all fields for the scheduled cell with the smallest serving cell index in this DCI except the '*CSI request*' and the UE shall not transmit the corresponding PUSCH on the serving cell with the smallest serving cell index as indicated by this DCI format 0\_3. When the UE is scheduled with multiple PUSCHs on a serving cell by a DCI, HARQ process ID indicated by this DCI applies to the first PUSCH not overlapping with a DL symbol indicated by *tdd-UL-DL-ConfigurationCommon* or *tdd-UL-DL-ConfigurationDedicated* if provided, or a symbol of an SS/PBCH block with index provided by *ssb-PositionsInBurst*, HARQ process ID is then incremented by 1 for each subsequent PUSCH(s) in the scheduled order, with modulo operation of *nrofHARQ-ProcessesForPUSCH* applied if *nrofHARQ-ProcessesForPUSCH* is provided, or with modulo operation of *nrofHARQ-ProcessesForPUSCH-r17* applied if *nrofHARQ-ProcessesForPUSCH-r17* is provided, or with modulo operation of 16 applied, otherwise. HARQ process ID is not incremented for PUSCH(s) not transmitted if at least one of the symbols indicated by the indexed row of the used resource allocation table in the slot overlaps with a DL symbol indicated by *tdd-UL-DL-ConfigurationCommon* or *tdd-UL-DL-ConfigurationDedicated* if provided, or a symbol of an SS/PBCH block with index provided by *ssb-PositionsInBurst*. For any HARQ process ID(s) in a given scheduled cell, the UE is not expected to transmit a PUSCH that overlaps in time with another PUSCH. Except for the case when a UE is configured by higher layer parameter *PDCCH-Config* that contains two different values of *coresetPoolIndex* in *ControlResourceSet* for the active BWP of a serving cell and PDCCHs that schedule two ~~non-overlapping in time domain~~ PUSCHs are associated to different *ControlResourceSets* having different values of *coresetPoolIndex,* for any two HARQ process IDs in a given scheduled cell, if the UE is scheduled to start a first PUSCH transmission starting in symbol *j* by a PDCCH ending in symbol *i* on a scheduling cell,, the UE is not expected to be scheduled to transmit a PUSCH starting earlier than the end of the first PUSCH by a PDCCH that ends later than symbol *i* of the scheduling cell. When the PDCCH reception includes two PDCCH candidates from two respective search space sets, as described in clause 10.1 of [6, TS 38.213], for the purpose of determining the PDCCH ending in symbol *i*, the PDCCH candidate that ends later in time is used. The UE is not expected to be scheduled to transmit another PUSCH by a DCI format 0\_0 with CRC scrambled by TC-RNTI, for a given HARQ process with the DCI received before the end of the expected transmission of the last PUSCH for that HARQ process if the latter is scheduled by a DCI format 0\_0 with CRC scrambled by TC-RNTI or by an UL grant in RA Response. The UE is not expected to be scheduled to transmit another PUSCH by DCI format 0\_0, 0\_1, 0\_2 or 0\_3 scrambled by C-RNTI, CS-RNTI or MCS-C-RNTI for a given HARQ process with the DCI received before the end of the expected transmission of the last PUSCH for that HARQ process if the latter is scheduled by a DCI with CRC scrambled by C-RNTI, CS-RNTI or MCS-C-RNTI.  < Unchanged parts are omitted > |

**Agreement**

The support of out of order PUSCH scheduling in Rel-18 multi-DCI based STxMP transmission is subject to UE capability.

**Agreement**

Adopt the following TP for 38.214:

* Reason for change:In the current specifications, the restriction of in order scheduling for PUSCH is applied to multi-DCI based STxMP PUSCH+PUSCH. That would cause some difficulty to the scheduling of STxMP PUSCH+PUSCH.
* Summary of change: Remove the “non-overlapping in time domain” from the specification text so that the STxMP PUSCH+PUSCH is included in the case of STxMP PUSCH+PUSCH can be scheduled with the out of order scheduling.
* Consequences if not approved: The scheduling of STxMP PUSCH+PUSCH in rel-18 has the restriction of in order scheduling.

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| ***6.1 UE procedure for transmitting the physical uplink shared channel***  <Unchanged parts are omitted>  If a UE is configured by higher layer parameter *PDCCH-Config* that contains two different values of *coresetPoolIndex* in *ControlResourceSet* for the active BWP of a serving cell and PDCCHs that schedule two ~~non-overlapping in time domain~~ PUSCHs are associated to different *ControlResourceSets* having different values of *coresetPoolIndex,* for any two HARQ process IDs in a given scheduled cell, if the UE is scheduled to start a first PUSCH transmission starting in symbol *j* by a PDCCH associated with a value of *coresetPoolIndex* ending in symbol *i*, the UE can be scheduled to transmit a PUSCH starting earlier than the end of the first PUSCH by a PDCCH associated with a different value of *coresetPoolIndex* that ends later than symbol *i*.  <Unchanged parts are omitted> |

**Agreement**

For SDM and SFN STxMP operation:

* For codebook-based transmission, the UE shall expect that the precoder indicated by the first TPMI and the precoder indicated by the second TPMI are mapped to different PUSCH antenna ports.
* For non-codebook based transmission, the UE shall expect that SRS resource(s) indicated by the first SRI and SRS resource(s) indicated by the second SRI are corresponding to different PUSCH antenna ports.

Note: No PUSCH precoder modification and/or PUSCH/SRS port re-indexing in the specification is expected.

Adopt the following TP for 38.214:

* Reason for change: In the current specifications, the precoder matrix *W* might be interpreted as different expressions of single DCI based STxMP PUSCH transmission in SDM/SFN scheme, which may cause ambiguity of how to apply precoding processing between UE side and gNB side.
* Summary of change: Add text in specification to clearly clarify that that the precoder indicated by the first TPMI/SRI and the precoder indicated by the second TPMI/SRI are applied to different PUSCH antenna ports for single DCI based STxMP CB/NCB PUSCH in SDM/SFN scheme.
* Consequences if not approved: Specification has ambiguity on how to apply the precoding of single DCI based STxMP CB/NCB PUSCH transmission in SDM/SFN scheme.

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| ***6.1.1.1 Codebook based UL transmission***  <Unchanged parts are omitted>  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', two SRI(s), and two TPMI(s) are given by the DCI fields of two SRS resource indicator and two Precoding information and number of layers in clause 7.3.1.1.2 and 7.3.1.1.3 of [5, TS 38.212] for DCI format 0\_1 and 0\_2:  - When codepoint "10" of *SRS Resource Set* *indicator* is indicated*,* the first TPMI is used to indicate the precoder to be applied over layers {0…v1-1}, where v1 is the number of layers indicated by the first TPMI, that corresponds to the SRS resource selected by the corresponding SRI when multiple SRS resources are configured for the applicable SRS resource set or if single SRS resource is configured for the applicable SRS resource set, and the second TPMI is used to indicate the precoder to be applied over layers {v1…. v2+v1-1}, where v2 is the number of layers indicated by the second TPMI, that corresponds to the SRS resource selected by the corresponding SRI when multiple SRS resources are configured for the applicable SRS resource set or if single SRS resource is configured for the applicable SRS resource set, v1 ≤ *maxRankSdm* andv2 ≤ *maxRankSdm* or *maxRankSdmDCI-0-2* and *maxRankSdm* or *maxRankSdmDCI-0-2* are defining the maximum number of layers applied over the first and the second SRS resource sets, separately.  - When codepoint "00" or "01" of *SRS Resource Set* *indicator* is indicated*,* the second SRI and second TPMI are reserved, the first TPMI is used to indicate the precoder to be applied over layers {0…v-1}, where v ≤ *maxRank,* where *maxRank* is defining the maximum number of layers.  - Codepoint "11" of *SRS Resource Set indicator* is reserved.  - For one or two TPMI(s), the transmission precoder is selected from the uplink codebook that has a number of antenna ports equal to the higher layer parameter *nrofSRS-Ports* in *SRS-Config* for the indicated SRI(s), as defined in Clause 6.3.1.5 of [4, TS 38.211]. When two TPMIs are indicated, the UE shall expect that the precoder indicated by the first TPMI and the precoder indicated by the second TPMI are mapped to different PUSCH antenna ports.  - When two SRIs are indicated, the UE shall expect that the number of SRS antenna ports associated with two indicated SRIs would be the same. When the UE is configured with the higher layer parameter *txConfig* set to 'codebook', the UE is configured with at least one SRS resource. Each of the indicated one or two SRI(s) in slot *n* is associated with the most recent transmission of SRS resource of associated SRS resource set identified by the SRI, where the SRS resource is prior to the PDCCH carrying the SRI. When 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', the UE is not expected to be configured with different number of SRS resources in the two SRS resource sets.  When higher layer parameter *multipanelScheme* 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', two SRI(s), and two TPMI(s) are given by the DCI fields of two SRS resource indicator and two Precoding information and number of layers in clause 7.3.1.1.2 and 7.3.1.1.3 of [5, TS 38.212] for DCI format 0\_1 and 0\_2.  - When codepoint "10" of *SRS Resource Set* *indicator* is indicated*,* the first TPMI is used to indicate precoder to be applied over layers {0…v-1} and the second TPMI is used to indicate the precoder to be applied over layers {0…v-1}, where v ≤ *maxRankSfn* or *maxRankSfnDCI-0-2* and *maxRankSfn* or *maxRankSfnDCI-0-2* defining the maximum number of layers applied over the first SRS resource set and over the second SRS resource set separately.  - When codepoint "00" or "01" of *SRS Resource Set* *indicator* is indicated*,* the second SRI and second TPMI are reserved, the first TPMI is used to indicate precoder to be applied over layers {0…v-1}, where v ≤ *maxRank* and where *maxRank* is defining the maximum number of layers applied over the first SRS resource set or the seoncd SRS resource.  - Codepoint "11" of *SRS Resource Set indicator* is reserved.  - For one or two TPMI(s), the transmission precoder is selected from the uplink codebook that has a number of antenna ports equal to *nrofSRS-Ports* in *SRS-Config* for the indicated SRI(s), as defined in Clause 6.3.1.5 of [4, TS 38.211]. When two TPMIs are indicated, the UE shall expect that the precoder indicated by the first TPMI and the precoder indicated by the second TPMI are mapped to different PUSCH antenna ports.  - When two TPMIs are indicated, the UE shall expect that the number of SRS antenna ports associated with two indicated SRIs to be the same. When the UE is configured with the higher layer parameter *txConfig* set to 'codebook', the UE is configured with at least one SRS resource. Each of the indicated one or two SRI(s) in slot *n* is associated with the most recent transmission of SRS resource of associated SRS resource set identified by the SRI, where the SRS resource is prior to the PDCCH carrying the SRI. When 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', the UE is not expected to be configured with different number of SRS resources in the two SRS resource sets.  <Unchanged parts are omitted>  ***6.1.1.2 Non-Codebook based UL transmission***  <Unchanged parts are omitted>  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 'nonCodebook', SRIs are given by the DCI fields of two SRS resource indicators in clause 7.3.1.1.2 and 7.3.1.1.3 of [5, TS 38.212] for DCI format 0\_1 and 0\_2.  - When codepoint "10" of *SRS Resource Set* *indicator* is indicated*,* the first SRI is used to indicate resource(s) to be associated with layer(s) {0…v1-1}}, where v1 being the number of layers indicated by the first SRI, and the second SRI is used to indicate resource(s) to be associated with layer(s) {v1…. v2+v1-1}, v1 ≤ *Lmax* andv2 ≤ *Lmax* where *Lmax* is defined is defined inclauses 7.3.1.1.2 and 7.3.1.1.3 of [5, TS 38.212]. The UE shall expect that SRS resource(s) indicated by the first SRI and SRS resource(s) indicated by the second SRI are corresponding to different PUSCH antenna ports.  - When codepoint "00" or "01" of *SRS Resource Set* *indicator* is indicated*,* the second SRI is reserved, the first SRI is used to indicate resource(s) to be associated with layers {0…v-1}, v ≤ *Lmax*.  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 'nonCodebook', two SRI(s) are given by the DCI fields of two SRS resource indicator and two Precoding information and number of layers in clause 7.3.1.1.2 and 7.3.1.1.3 of [5, TS 38.212] for DCI format 0\_1 and 0\_2.  - When codepoint "10" of *SRS Resource Set* *indicator* is indicated*,* the first SRI is used to indicate resource(s) to be associated with layer(s) {0…v-1} and the second SRI is used to indicate resource(s) to be associated with layer(s) {0…v-1}, where v ≤ *Lmax* and where *Lmax* is defined in clauses 7.3.1.1.2 and 7.3.1.1.3 of [5, TS 38.212]. The UE shall expect that SRS resource(s) indicated by the first SRI and SRS resource(s) indicated by the second SRI are corresponding to different PUSCH antenna ports.  - When codepoint "00" or "01" of *SRS Resource Set* *indicator* is indicated*,* the second SRI is reserved, the first SRI is used to indicate resources(s) to be associated with layers {0…v-1}, where v ≤ *Lmax*. When two SRIs are indicated, the UE shall expect that the number of SRS antenna ports associated with two indicated SRIs to be the same.  - Codepoint "11" of *SRS Resource Set indicator* is reserved.  When the UE is configured with the higher layer parameter *txConfig* set to 'Noncodebook', the UE is configured with at least one SRS resource. Each of the indicated one or two SRI(s) in slot *n* is associated with the most recent transmission of SRS resource of associated SRS resource set identified by the SRI, where the SRS resource is prior to the PDCCH carrying the SRI. When two SRS resource sets are configured in *srs-ResourceSetToAddModList* or *srs-ResourceSetToAddModListDCI-0-2* with higher layer parameter *usage* in *SRS-ResourceSet* set to 'Noncodebook', the UE is not expected to be configured with different number of SRS resources in the two SRS resource sets.  <Unchanged parts are omitted> |

**Agreement**

When multi-DCI based STxMP PUSCH+PUSCH is configured, the UE expects to be configured with two SRS resource sets with usage *‘codebook’* or *‘nonCodeBook’* in *srs-ResourceSetToAddModList*

* When UE is configured to monitor DCI format 0\_2 and if two SRS resource sets of CB/NCB are configured for DCI 0\_1while one SRS resource set of CB/NCB is configured for DCI 0\_2, the UE monitors DCI format 0\_2 only in coresets associated with *CORESETPoolIndex* = 0.

**Agreement**

Adopt the following text proposals to TS 38.211.

* Reason for change: Tables 6.3.1.5-25 -.6.3.1.5-28 and 6.3.1.5-37 -.6.3.1.5-38 do not correspond to .
* Summary of change: Remove Tables 6.3.1.5-25 - 6.3.1.5-28 and 6.3.1.5-37 - 6.3.1.5-38 from the list of tables.
* Consequences if not approved: Inaccurate description of precoding in 6.3.1.5 when using 8 antenna ports.

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| 6.3.1.5 Precoding  -------------------------------------------Unchanged parts are omitted-------------------------------------------  For codebook-based transmission, the precoding matrix depends on the number of antenna ports used for the transmission:  - for single-layer transmission on a single antenna port, ;  - for transmissions using 2, or 4 antenna ports, is given by Tables 6.3.1.5-1 to 6.3.1.5-7;  - for transmissions using 8 antenna ports, is given by  where  - the subscripts and denote the row of the respective matrix;  - is given by Table 6.3.1.5-8;  - the intermediate precoding matrix is given by Tables 6.3.1.5-9 to 6.3.1.5-24 and 6.3.1.5-29 to 6.3.1.5-36 and 6.3.1.5-39 to 6.3.1.5-47 with representing the all-zero matrix with rows and columns;  - the submatrices are given by Tables 6.3.1.5-25 to 6.3.1.5-28 and 6.3.1.5-37 to 6.3.1.5-38.  -------------------------------------------Unchanged parts are omitted------------------------------------------- |

**Agreement**

Adopt the following text proposals to TS 38.211.

* Reason for change: Correcting a typo in titles of tables.
* Summary of change: Change to
* Consequences if not approved: Inaccurate description of precoding in 6.3.1.5 when using 8 antenna ports.

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| -------------------------------------------Unchanged parts are omitted-------------------------------------------  **Table 6.3.1.5-9: Intermediate precoding matrix ~~Precoding matrix~~  for *codebook1=ng1n4n1* and single-layer transmission using eight antenna ports.**   |  |  | | --- | --- | | **TPMI index** | **Intermediate precoder matrix**  **(ordered from left to right in increasing order of TPMI index)** |   -------------------------------------------Unchanged parts are omitted-------------------------------------------  **Table 6.3.1.5-10: Intermediate precoding matrix ~~Precoding matrix~~  for *codebook1=ng1n4n1* and two-layer transmission using eight antenna ports with transform precoding disabled.**   |  |  | | --- | --- | | **TPMI index** | **Intermediate precoder matrix**  **(ordered from left to right in increasing order of TPMI index)** |   -------------------------------------------Unchanged parts are omitted-------------------------------------------  **Table 6.3.1.5-11: Intermediate precoding matrix ~~Precoding matrix~~  for *codebook1=ng1n4n1* and three-layer transmission using eight antenna ports with transform precoding disabled.**   |  |  | | --- | --- | | **TPMI index** | **Intermediate precoder matrix**  **(ordered from left to right in increasing order of TPMI index)** |   -------------------------------------------Unchanged parts are omitted-------------------------------------------  **Table 6.3.1.5-12: Intermediate precoding matrix ~~Precoding matrix~~  for *codebook1=ng1n4n1* and four-layer transmission using eight antenna ports with transform precoding disabled.**   |  |  | | --- | --- | | **TPMI index** | **Intermediate precoder matrix**  **(ordered from left to right in increasing order of TPMI index)** |   -------------------------------------------Unchanged parts are omitted-------------------------------------------  **Table 6.3.1.5-13: Intermediate precoding matrix ~~Precoding matrix~~  for *codebook1=ng1n4n1* and five-layer transmission using eight antenna ports with transform precoding disabled.**   |  |  | | --- | --- | | **TPMI index** | **Intermediate precoder matrix**  **(ordered from left to right in increasing order of TPMI index)** |   -------------------------------------------Unchanged parts are omitted-------------------------------------------  **Table 6.3.1.5-14: Intermediate precoding matrix ~~Precoding matrix~~  for *codebook1=ng1n4n1* and six-layer transmission using eight antenna ports with transform precoding disabled.**   |  |  | | --- | --- | | **TPMI index** | **Intermediate precoder matrix**  **(ordered from left to right in increasing order of TPMI index)** |   -------------------------------------------Unchanged parts are omitted-------------------------------------------  **Table 6.3.1.5-15: Intermediate precoding matrix ~~Precoding matrix~~  for *codebook1=ng1n4n1* and seven-layer transmission using eight antenna ports with transform precoding disabled.**   |  |  | | --- | --- | | **TPMI index** | **Intermediate precoder matrix**  **(ordered from left to right in increasing order of TPMI index)** |   -------------------------------------------Unchanged parts are omitted-------------------------------------------  **Table 6.3.1.5-16: Intermediate precoding matrix ~~Precoding matrix~~  for *codebook1=ng1n4n1* and eight-layer transmission using eight antenna ports with transform precoding disabled.**   |  |  | | --- | --- | | **TPMI index** | **Intermediate precoder matrix**  **(ordered from left to right in increasing order of TPMI index)** |   -------------------------------------------Unchanged parts are omitted-------------------------------------------  **Table 6.3.1.5-17: Intermediate precoding matrix ~~Precoding matrix~~  for *codebook1=ng1n2n2* and single-layer transmission using eight antenna ports.**   |  |  | | --- | --- | | **TPMI index** | **Intermediate precoder matrix**  **(ordered from left to right in increasing order of TPMI index)** |   -------------------------------------------Unchanged parts are omitted-------------------------------------------  **Table 6.3.1.5-18: Intermediate precoding matrix ~~Precoding matrix~~  for *codebook1=ng1n2n2* and two-layer transmission using eight antenna ports with transform precoding disabled.**   |  |  | | --- | --- | | **TPMI index** | **Intermediate precoder matrix**  **(ordered from left to right in increasing order of TPMI index)** |   -------------------------------------------Unchanged parts are omitted-------------------------------------------  **Table 6.3.1.5-19: Intermediate precoding matrix ~~Precoding matrix~~  for *codebook1=ng1n2n2* and three-layer transmission using eight antenna ports with transform precoding disabled.**   |  |  | | --- | --- | | **TPMI index** | **Intermediate precoder matrix**  **(ordered from left to right in increasing order of TPMI index)** |   -------------------------------------------Unchanged parts are omitted-------------------------------------------  **Table 6.3.1.5-20: Intermediate precoding matrix ~~Precoding matrix~~  for *codebook1=ng1n2n2* and four-layer transmission using eight antenna ports with transform precoding disabled.**   |  |  | | --- | --- | | **TPMI index** | **Intermediate precoder matrix**  **(ordered from left to right in increasing order of TPMI index)** |   -------------------------------------------Unchanged parts are omitted-------------------------------------------  **Table 6.3.1.5-21: Intermediate precoding matrix ~~Precoding matrix~~  for *codebook1=ng1n2n2* and five-layer transmission using eight antenna ports with transform precoding disabled.**   |  |  | | --- | --- | | **TPMI index** | **Intermediate precoder matrix**  **(ordered from left to right in increasing order of TPMI index)** |   -------------------------------------------Unchanged parts are omitted-------------------------------------------  **Table 6.3.1.5-22: Intermediate precoding matrix ~~Precoding matrix~~  for *codebook1=ng1n2n2* and six-layer transmission using eight antenna ports with transform precoding disabled.**   |  |  | | --- | --- | | **TPMI index** | **Intermediate precoder matrix**  **(ordered from left to right in increasing order of TPMI index)** |   -------------------------------------------Unchanged parts are omitted-------------------------------------------  **Table 6.3.1.5-23: Intermediate precoding matrix ~~Precoding matrix~~  for *codebook1=ng1n2n2* and seven-layer transmission using eight antenna ports with transform precoding disabled.**   |  |  | | --- | --- | | **TPMI index** | **Intermediate precoder matrix**  **(ordered from left to right in increasing order of TPMI index)** |   -------------------------------------------Unchanged parts are omitted-------------------------------------------  **Table 6.3.1.5-24: Intermediate precoding matrix ~~Precoding matrix~~  for *codebook1=ng1n2n2* and eight-layer transmission using eight antenna ports with transform precoding disabled.**   |  |  | | --- | --- | | **TPMI index** | **Intermediate precoder matrix**  **(ordered from left to right in increasing order of TPMI index)** |   -------------------------------------------Unchanged parts are omitted-------------------------------------------  **Table 6.3.1.5-47: Intermediate precoding matrix ~~Precoding matrix~~  for *codebook4* and transmission using eight antenna ports. Up to 8 layers are supported with transform precoding disabled and up to one layer with transform precoding enabled.**   |  |  | | --- | --- | | **TPMI index** | **Intermediate precoder matrix** |   -------------------------------------------Unchanged parts are omitted------------------------------------------- |

**Agreement**

Adopt the following text proposals to TS 38.211.

* Reason for change: To correctly capture the applicability of submatrices according to the agreed layer splitting for codebook2 (Ng=2) and codebook3 (Ng=4).
* Summary of change: Correct the title of the Tables related to submatrices.
* Consequences if not approved: Inaccurate capture of the agreement related to layer splitting for codebook2(Ng=2) and codebook3 (Ng=4).

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| 6.3.1.5 Precoding  --------------------------------------<Unchanged parts omitted>--------------------------------------  **Table 6.3.1.5-25: Submatrices for codebook2 and used in Tables 6.3.1.5-29 to 6.3.1.5-~~363~~1.**  --------------------------------------<Unchanged parts omitted>--------------------------------------  **Table 6.3.1.5-26: Submatrices for codebook2 and used in Tables 6.3.1.5-~~29~~30 to 6.3.1.5-~~36~~33.**  --------------------------------------<Unchanged parts omitted>--------------------------------------  **Table 6.3.1.5-27: Submatrices for codebook2 and used in Tables ~~6.3.1.5-29 to 6.3.1.5-36~~ 6.3.1.5-31, 6.3.1.5-33, 6.3.1.5-34 and 6.3.1.5-35**  --------------------------------------<Unchanged parts omitted>--------------------------------------  **Table 6.3.1.5-28: Submatrices for codebook2 and used in Tables ~~6.3.1.5-29 to 6.3.1.5-36~~ 6.3.1.5-32, 6.3.1.5-35 and 6.3.1.5-36**  --------------------------------------<Unchanged parts omitted>--------------------------------------  **Table 6.3.1.5-37: Submatrices for codebook3 and used in Tables 6.3.1.5-39 to 6.3.1.5-~~46~~45**  --------------------------------------<Unchanged parts omitted>--------------------------------------  **Table 6.3.1.5-38: Submatrices for codebook3 and used in Tables 6.3.1.5-~~39~~40 to 6.3.1.5-46.**  --------------------------------------<Unchanged parts omitted>-------------------------------------- |

**Agreement**

Adopt the following text proposal to TS 38.214.

* Reason for change: The current wording in the specifications is intended for single codeword PUSCH. For dual codeword PUSCH, the number of CBGs should be determined per transport block.
* Summary of change: The wording “PUSCH” is changed to “transport block”.
* Consequences if not approved: There could be misunderstanding that two CWs would be applied when either maxRank or maxMIMO-Layers is larger than 4 regardless of the transmission scheme.

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| 6.1.5.1 UE procedure for grouping of code blocks to code block groups  If a UE is configured to transmit code block group (CBG) based transmissions by receiving the higher layer parameter *codeBlockGroupTransmission* in *PUSCH-ServingCellConfig*, the UE shall determine the number of CBGs for a ~~PUSCH~~ transport block transmission as  ,  where *N* is the maximum number of CBGs per transport block as configured by *maxCodeBlockGroupsPerTransportBlock* in *PUSCH-ServingCellConfig*, and *C* is the number of code blocks in the ~~PUSCH~~ transport block according to the procedure defined in Clause 6.2.3 of [5, TS 38.212].  -------------------------------------------Unchanged parts are omitted------------------------------------------- |

**Agreement**

Adopt the following text proposal to TS 38.214.

* Reason for change: To capture the conclusion that configured grant PUSCH is restricted to 4 layers even for 8TX UE.
* Summary of change: Add a sentence to clarify.
* Consequences if not approved: There could be a potential misunderstanding that configured grant PUSCH with more than 4 layers can be supported by an 8TX UE.

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| 6.1 UE procedure for transmitting the physical uplink shared channel  -------------------------------------------Unchanged parts are omitted-------------------------------------------  For the PUSCH transmission corresponding to a Type 1 configured grant or a Type 2 configured grant activated by DCI format 0\_0 or 0\_1, the parameters applied for the transmission are provided by *configuredGrantConfig* except for *dataScramblingIdentityPUSCH*, *txConfig*, *codebookSubset*, *maxRank*, *scaling* of *UCI-OnPUSCH,* which are provided by *pusch-Config*. A configured grant PUSCH can be transmitted with at most 4 layers. For the PUSCH transmission corresponding to a Type 2 configured grant activated by DCI format 0\_2, the parameters applied for the transmission are provided by *configuredGrantConfig* except for *dataScramblingIdentityPUSCH*, *txConfig*, *codebookSubsetDCI-0-2*, *maxRankDCI-0-2*, *scaling* of *UCI-OnPUSCH*, *resourceAllocationType1GranularityDCI-0-2* provided by *pusch-Config*.If the UE is provided with *transformPrecoder* in *configuredGrantConfig*, the UE applies the higher layer parameter *tp-pi2BPSK*, if provided in *pusch-Config*, according to the procedure described in clause 6.1.4 for the PUSCH transmission corresponding to a configured grant.  -------------------------------------------Unchanged parts are omitted------------------------------------------- |

**Conclusion**

In Rel-18,there is no consensus to support use of DCI format 0\_3 for scheduling a PUSCH for an 8TX UE.

**Agreement**

Adopt the following text proposal to TS 38.213.

* Reason for change: The exiting table in the specifications is accurate only for single codeword PUSCH.
* Summary of change: Add a column to separate the case for DCI format 0\_1 from DCI format 0\_0/0\_2.
* Consequences if not approved: Inaccurate capture of the operation.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| -------------------------------------------Unchanged parts are omitted-------------------------------------------  **Table 10.2-1: Special fields for single DL SPS or single UL grant Type 2 scheduling activation PDCCH validation when a UE is provided a single SPS PDSCH or UL grant Type 2 configuration in the active DL/UL BWP of the scheduled cell**   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | **DCI format 0\_0~~/0\_1~~/0\_2** | **DCI format 0\_1** | **DCI format 1\_0/1\_2/4\_1** | **DCI format 1\_1/4\_2** | | HARQ process number  (if present) | set to all '0's | set to all '0's | set to all '0's | set to all '0's | | Redundancy version  (if present) | set to all '0's | For the enabled transport block: set to all '0's | set to all '0's | For the enabled transport block: set to all '0's |   -------------------------------------------Unchanged parts are omitted-------------------------------------------  **Table 10.2-3: Special fields for a single DL SPS or single UL grant Type 2 scheduling activation PDCCH validation when a UE is provided multiple DL SPS or UL grant Type 2 configurations in the active DL/UL BWP of the scheduled cell**   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | **DCI format 0\_0~~/0\_1~~/0\_2** | **DCI format 0\_1** | **DCI format 1\_0/1\_2/4\_1** | **DCI format 1\_1/4\_2** | | Redundancy version  (if present) | set to all '0's | For the enabled transport block: set to all '0's | set to all '0's | For the enabled transport block: set to all '0's |   -------------------------------------------Unchanged parts are omitted------------------------------------------- |

**Agreement**

Adopt the following text proposal to TS 38.214.

* Reason for change: Defining UE behavior for virtualization-based fullpowerMode2.
* Summary of change: Adding a new text based on the legacy UE behavior.
* Consequences if not approved: Incomplete description of fullpowerMode2.

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| 6.1.1.1 Codebook based UL transmission  -------------------------------------------Unchanged parts are omitted-------------------------------------------  When higher layer parameter *ul-FullPowerTransmission* is set to '*fullpowerMode2'* and the higher layer parameter *codebookSubset* or the higher layer parameter *codebookSubsetDCI-0-2* is set to *'*partialAndNonCoherent', and when the SRS-resourceSet with usage set to "codebook" includes at least one SRS resource with 4 ports and one SRS resource with 2 ports, the codebookSubset associated with the 2-port SRS resource is 'nonCoherent'.  When higher layer parameter *ul-FullPowerTransmission* is set to '*fullpowerMode2'* and the higher layer parameter *codebookType* is set to *'*Codebook2' or *'*Codebook3', and the SRS-resourceSet with usage set to "codebook" includes one SRS resource with 8 ports, and at least one SRS resource with 2 ports or 4 ports, subject to UE capability,   * when *codebookType* is set to *'*Codebook2', the *codebookSubset* associated with the 2-port SRS resource is 'nonCoherent'. * when *codebookType* is set to *'*Codebook2', the *codebookSubset* associated with the 4-port SRS resource can be configured as 'partialAndNonCoherent' or 'nonCoherent', subject to UE capability. * when *codebookType* is set to *'*Codebook3', the codebooksubset associated with 4 ports SRS resources is 'nonCoherent'.   The maximum transmission rank may be configured by the higher layer parameter *maxRank* in *pusch-Config* for PUSCH scheduled with DCI format 0\_1 or 0\_3 and *maxRankDCI-0-2* for PUSCH scheduled with DCI format 0\_2*.*  -------------------------------------------Unchanged parts are omitted------------------------------------------- |

**Agreement**

Adopt the following text proposals to TS 38.211 and TS 38.214.

* Reason for change: The current specifications in TS 38.211 and TS 38.214 do not clearly describe the relationship between codebook1, codebook2, codebook3, codebook4 and antenna port groups.
* Summary of change: Addition of four columns to the existing Table 6.3.1.5-8
* Consequences if not approved: Unclear association of antenna ports to antenna port groups.

-------------------------------------------Unchanged parts are omitted-------------------------------------------

**Table 6.3.1.5-8: The port mapping function for transmission using 8 antenna ports.**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Higher-layer parameter *CodebookType*** | | | | | | | |
| **codebook1** | | **codebook2** | | **codebook3** | | **codebook4** | |
| 0 | Antenna port group 0 | 0 | Antenna port group 0 | 0 | Antenna port group 0 | 0 | Antenna port group 0 | 0 |
| 1 | 1 | 1 | 4 | Antenna port group 1 | 1 |
| 2 | 2 | 4 | Antenna port group 1 | 1 | Antenna port group 2 | 2 |
| 3 | 3 | 5 | 5 | Antenna port group 3 | 3 |
| 4 | 4 | Antenna port group 1 | 2 | Antenna port group 2 | 2 | Antenna port group 4 | 4 |
| 5 | 5 | 3 | 6 | Antenna port group 5 | 5 |
| 6 | 6 | 6 | Antenna port group 3 | 3 | Antenna port group 6 | 6 |
| 7 | 7 | 7 | 7 | Antenna port group 7 | 7 |

-------------------------------------------Unchanged parts are omitted-------------------------------------------

**Agreement**

* Adopt the following text proposal to TS 38.214.

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| -------------------------------------------Unchanged parts are omitted-------------------------------------------  For codebook based transmission with eight antenna ports, the UE determines its codebook based upon the reception of higher layer parameter[s] *CodebookType* and *ULcodebookFC-N1N2* if *CodebookType* is configured with Ng=1 in pusch-Config for PUSCH associated with DCI format 0\_1 and 0\_2, depending on the UE capability. According to the configured *CodebookType*, requirements for coherent UL MIMO in [38.101-1] and [38.101-2] apply within an antenna port group.  -------------------------------------------Unchanged parts are omitted------------------------------------------- |

* Send an LS to RAN4 that RAN1 assumes RAN4 will define the relative phase and power error requirements within the port groups for 8TX UEs. LS is endorsed in R1-2312566

#### 2.1.2 Remaining Open issues

RAN1 completed the work. Some remaining details will be completed during maintenance phase.

## 2.2 RAN2

#### 2.2.1 Agreements

**RAN2#123bis (Xiamen, China, October 2023)**

* In IE ControlResourceset, add value “None” to applyIndicatedTCI-State (first, second, both, none) and do not configure with followUnifiedTCI-State-r17. FFS if the same can be achieved if this field is not included at all.

*Proposal 2 Configure the parameter applyIndicatedTCIState-r18 per PUCCH resource and not additionally to PUCCH groups*

*Proposal 4 In IE SRS-Config applyIndicatedTCIState-r18 and followUnifiedTCI-StateSRS are configured separately for r18 mTRP and r17 sTRP. -Cond is added:*

*FollowUTCI The field is absent if the field followUnifiedTCI-State is present. Otherwise, it is optionally present, Need R.*

*Proposal 5 Do not use numberOfSDCombinations and numberOfSDCombinations-PS*

*Proposal 6 IN IE TDCP(new) in IE CSI-ReportConfig The value of Y can be deferred from the list length of delayDSetofLenghtY-r18*

*Proposal 7 Move parameter m (aperiodicResourceOffset-r18) from IE NZP-CSI-RS-ResourceSet to IE CodebookConfig-r18 under typeII-Doppler-r1 and specify relation in field description.*

*Proposal 9 For codebook config:*

*As baseline assumption CodebookConfig is critically extended.*

*Field description for n1-n2-codebookSubsetRestrictionList includes configuration restriction for same n1-n2 for each element.*

*Optionality of n1-n2-codebookSubsetRestrictionList is removed to ensure at least one element is included.*

*Optionality and field description need further review and it can be considered to send LS from next meeting for RAN1 to review the optionality of the parameters, FFS other things.*

*Proposal 10 Wait for Ran1 input for ”applyIndicatedTCIState should be added within the PDCCH-ConfigCommon to indicate whether/which TCI state to be applied for corset 0”*

* P2, P4-7, P9-P10 are taken as baseline for further stage 3 specification development.
* The filed description for CSI-AssociatedReportConfigInfo will be updated, using P3 in R2-2311290 as baseline. Details to be further checked.
* Confirmed: We will use the 2-PTAG model, i.e., both TAGs of SpCell are PTAGs;
* The following are taken as baseline
* When the TAT for STAG is expired and the other TAT is running for a serving cell (i.e., SCell), no impact to the TRP with running TAT; 1 and 3-7 are applied to the TRP with TAT expired, i.e., 2 is not applied.
* when the TAT for PTAG is expired and the other TAT is running for a serving cell (SpCell or SCell), no impact to the TRP with running TAT; 1 and 3-7 are applied to the TRP with TAT expired, i.e., 2 is not applied.
* One R bit in Absolute TAC MAC CE is used to indicate TAG ID, i.e. which TAG’s TA is updated.
* The baseline is confirmed as agreement: One R bit in RAR is used to indicate TAG ID, i.e. which TAG’s TA is updated. FFS if the association between the TAGs and value of the R bit (0 or 1) need to be configured by RRC.
* RAN2 confirm that separate MAC CEs on the enhanced unified TCI state for Single-DCI based multi-TRP operation are introduced for joint TCI State and separate DL/UL TCI States, respectively.
* The current running CR for MAC spec is used as the base line. Details can be further discussed.
* RRC configuration restriction that ‘The network does not configure the field in a serving cell that is configured with more than one value for the *coresetPoolIndex*’ for unifiedTCI-StateType need to be removed. FFS how, and FFS if this also impact other conditions and configurations.

**RAN2#124 (Chicago, USA, November 2023)**

* For inter-cell PDCCH order, use the R bit in RAR to indicate TAG, i.e., same as intra-cell PDCCH order CFRA.
* RRC configures the association between TAG ID and 1st/2nd TAG in RAR. FFS a RRC parameter to indicate the association.
* RACH configuration for the additionalPCI shall only be used for inter-cell PDCCH ordered CFRA, i.e., not used for UE initiated RACH.
* HARQ ACK is not generated if the TCI state to be applied for the HARQ feedback transmission is associated to a TAG with TAT expired.
* RAN2 to at least adopt as content for RACH configuration per additionaPCI(7 of these) IE RACH-ConfigGeneric, ssb-perRACH-Occasion and prach-RootSequenceIndex. Can further discuss if any other parameter(s) are needed.
* RAN2 to introduce the parameters tag-Id2-r18 n-TimingAdvanceOffset2-r18 in ServingCellConfig
* TAG indication is not included in successRAR
* TAG indication is supported for FallbackRAR
* For 2-step RACH: For the RACH triggered by SR, if the TAT(s) associated with at least one PTAG is running, the UE considers the RACH completion upon reception of C-RNTI addressed PDCCH that schedules a new UL transmission.
* PSCells with 2 TAs are not assumed to be deactivated in this release.
* RAN2 considers the following as a baseline (which follows the legacy behaviour)

- The MAC entity considers TAT associated with the concerned sTAG as expired, when UE stops UL transmission for the STAG due to MTTD issue.

* MAC captures the description that “the RACH configuration for AdditionalPCIIndex is applied when PDDCH indicates CFRA for the AdditionalPCIIndex, as specified in TS 38.212 clause 7.3.1.2.”.
* RACH configuration for additionalPCIs is configured in dedicated signaling either initialBWP and/or dedicated BWPs.
* Add additionalRACH-perPCI-ToAddModList in IE BWP-UplinkCommon in RRC CR. Make separate IE for the RACH config. It is clarified in the field description that the configuration can differ for different UEs.
* Add in IE servingcellConfig a field which maps one TAG id to value 0 or 1 (for the R bit in RAR and in the absolute TAC MAC CE)
* The RRC configurations for PUCCH/SRS are kept, when the TAT for STAG/PTAG is expired and the other TAT of the same cell is running.

#### 2.2.2 Remaining Open issues

None. RAN2 completed the work. Corrections will be completed during maintenance phase.

## 2.3 RAN3

n/a

#### 2.3.1 Agreements

#### 2.3.2 Remaining Open issues

## 2.4 RAN4

#### 2.4.1 Agreements

**RAN4#108-bis October 9 – October 13 2023, Xiamen, China**

The following agreements and conclusions were made in RAN4 #108-bis:

1. **RF related:**

**WF on STxMP UE RF requirements was approved in R4-2317604.**

<Sub-topic 1-1> Overlapped beam handling

<Online agreement>

- Overlapping indication is not needed in Rel-18

- Further discuss overlapping indications in the future release.

<Sub-topic 1-2> PUMAX,f,c,k

<Online agreement>

- Introduce PUMAX,f,c,k in the core requirements with minimal impacts in Rel-18

- FFS of PUMAX,f,c and PUMAX,f,c,k on the testability issue in future release

- FFS on the minimal impacts

<Sub-topic 1-3> MPRf,c,k/A-MPRf,c,k

<Way forward>: MPRf,c,k/A-MPRf,c,k derivation without overlapped beam indication

- Option 1: MAX(MPRf,c, A- MPRf,c,) + X dB, where X is

- Option 1a: 10\*log (number of UL TCI-states indicated for STxMP) dB

- Option 1b: [3 dB] for STxMP

- Option 2: MAX(X, MPRf,c, A- MPRf,c,), where X is

- Option 2a: 10\*log (number of UL TCI-states indicated for STxMP) dB

- Option 2b: [3 dB] for STxMP

<Way forward>: Additional relaxation (ΔTSTxMP)

- Whether to leave additional relaxation, outside of MAX(MPR) to the lower bound, will be further discussed together with MPRf,c,k and/or for future implementation constraints

<Sub-topic 1-4> P-MPRf,c,k

<Agreement>: P-MPR and PHR enhancement for Rel-18 STxMP

- Recommended WF: P-MPR value is completely left to UE implementation for MPE compliance

<Sub-topic 1-5> Testability

<Agreement>: Whether to send LS to RAN5, with following proposal

- Do not send LS to RAN5 and stop further discussion in this release.

1. **RRM related**

**WF on NR\_MIMO\_evo\_DL\_UL WI was approved in R4-2317371.**

**Issue 1-1-1: Whether to specify RRM requirements for Rel-18 SRS enhancement for 8TX UL?**

**Agreement**:

- Not to specify new SRS switching RRM requirements for 8TX UL. Legacy requirements of Interruptions at NR SRS antenna port switching can be reused.

**Issue 2-1-1: Channel model for TDCP for feasibility study**

**Agreement**:

Channel model for TDCP for feasibility study

* Agree to use TDL as baseline
* Other channel model (e.g., simplified/modified TDL, or CDL) can be considered if it finds not feasible with TDL channel.

**Issue 2-1-3: How to achieve ideal value of TDCP reporting?**

**Agreement**:

How to achieve ideal value of TDCP reporting for the feasibility study

* As starting point, for TDL channel, ideal value can be calculated for each delay value and over different doppler spread (*fmax)*.
* Other options (if any) can be considered.

**Issue 2-1-4: Is it feasible to define TDCP accuracy requirement for TDCP?**

**Agreement**:

Other essential parameters for the feasibility study of defining TDCP accuracy requirement

* Duration between TRS symbols
* Doppler spread fmax for TDL
  + Doppler can be additionally considered if CDL is to be considered.
* SNR
* Number of averaging samples: one shot as baseline, other UE implementation not precluded for the feasibility study.
* Channel bandwidth
* Reference channel estimation algorithm
* Further study on feasibility study on TDCP accuracy requirements based on existing evaluation results and additional evaluation results in RAN4#109 meeting. Make a conclusion of feasibility study in RAN4#109 meeting.
  + Draft CR on TDCP is expected to be submitted in the next meeting, and whether it can be agreeable depending on the conclusion of feasibility study.

Understanding of other parameters:

* Wideband measurement based on RAN1 definition

Link level simulation assumptions for evaluating TRS based TDCP measurements in NR

|  |  |
| --- | --- |
| Parameter | Value |
| Delay (between TRS symbols) | 1slot |
| Channel model | TDL-A, delay spread=30ns |
| Doppler Spread | 10, 30, 75, 100, 200, 300 |
| SNR | 5:5:20 |
| Number of averaging samples: | one shot as baseline, 4 samples |
| Channel BW | 10MHz |
| SCS | 30KHz as baseline, 15KHz 2nd priority |
| Reference Channel estimation | LS CE for TRS as baseline, MMSE CE as 2nd priority |
| Correlation matrix and antenna configuration | 1x2 Low |

Simulation results to be considered:

* CDF curves of (including the 90% and 50% and 10% CDF points) for estimated TDCP.

TDCP calculation reference:

**Issue 3-1-1: DL reference timing**

**Agreement**:

* For multi-DCI based multi-TRP operation with two TAs, for each TAG, the uplink transmission timing takes place before the reception of the first detected path (in time) of the corresponding downlink frame of the reference signal associated with UL/joint TCI state.

**Issue 4-1-1: For eUTCI, whether to support simultaneous reception in mTRP scenarios in FR2?**

**Agreement**:

* RAN4 not specify the requirements for eUTCI with simultaneous reception in DL in FR2 in Rel-18

**Issue 4-1-2: Whether to introduce RRM requirements for eUTCI if UE can support sTxMP?**

**Agreement:**

* Not specify requirements for eUTCI with simultaneous UL transmission with multi-panels in Rel-18

**Issue 4-1-3: For mDCI mTRP, how to specify RRM requirements for eUTCI if UE cannot support simultaneous DL reception in FR2?**

**Agreement**:

For mDCI mTRP, RRM requiements: eUTCI if UE cannot support simultaneous DL reception in FR2?

* For UEs doesn’t have the capability of supporting two TAs, Rel-17 unified TCI state switching requirements are applicable for each TCI state associated with coresetPoolIndex independently
* For UEs has the capability of supporting two TAs and not capable to support RTD > CP Rel-17 unified TCI state switching requirements are applicable for each TCI state associated with coresetPoolIndex independently
  + - FFS on requirement if the SSB are overlapped or adjacent.
* If the RTD is less than CP, reuse L1-RSRP in 9.5 for serving cell and 9.13 for additionalPCI.
* FFS on requirements for UEs with capability of supporting two TAs and capable to support RTD > CP

**Issue 4-1-4: For sDCI mTRP if dual TCI state is switched, if UE cannot support simultaneous DL reception in FR2, whether to define MAC-CE based TCI state switch delay for cases?**

**Agreement**:

For sDCI, define requirements for MAC-CE based TCI state switch delay for cases:

* Case1: If both target TCIs are known
* Case 2: If one of target TCIs is unknown and another is known
* Case 3: If both target TCIs are unknown

**Issue 4-1-5: For sDCI mTRP if dual TCI state is switched, if UE cannot support simultaneous DL reception in FR2, how to specify MAC CE based dual TCI state switch the switching delay requirements for Case 1?**

**Agreement**:

For sDCI, MAC CE based dual TCI state switch the switching delay requirements for Case 1:

MAC CE based dual TCI state switch requirement:

FR1 and FR2 (SSB are not adjacent):

* DL: THARQ + + max{TOk1\*(Tfirst-SSB1 + TSSB-proc), TOk2\*(Tfirst-SSB2 + TSSB-proc)} / NR slot length

FR2 (SSB are adjacent):

* Longer delay is expected or one SSB period extension is needed.

UL MAC CE based dual TCI state switch requirement:

PL-RS are not overlapped or adjacent:

* UL:
  + THARQ + + max{NM1\* (Tfirst\_target-PL-RS1 + 4\*Ttarget\_PL-RS1 + 2ms), NM2\* (Tfirst\_target-PL-RS2 + 4\*Ttarget\_PL-RS 2+ 2ms) } / *NR slot length*

PL-RS (CSI-RS is used as PL-RS) are overlapped or adjacent:

* No requirements.

**Issue 4-1-6: For sDCI mTRP if dual TCI state is switched, if UE cannot support simultaneous DL reception in FR2, how to specify MAC CE based dual TCI state switch the switching delay requirements for Case 2?**

**Agreement**:

MAC CE based dual TCI state switch requirement:

FR1 and FR2 (SSB are not adjacent):

* DL:
  + THARQ + + max{TL1-RSRP1 +TOuk1\*(Tfirst-SSB1+ TSSB-proc), TOk2\*(Tfirst-SSB2+ TSSB-proc)} / *NR slot length;* TL1-RSRP1, TOuk1, and Tfirst-SSB1 related to the unknown state and TOk2, and Tfirst-SSB2 related to the known state

FR2 (SSB are adjacent):

* Longer delay is expected or one SSB period is needed.

FFS on whether to define additional requirements if UE received PDSCH from single TRP.

UL MAC CE based dual TCI state switch requirement:

PL-RS are not overlapped or adjacent:

* THARQ + + max{ TL1-RSRP1 + Tfirst\_target-PL-RS1 + 4\*Ttarget\_PL-RS1 + 2ms, NM2\* (Tfirst\_target-PL-RS2 + 4\*Ttarget\_PL-RS 2+ 2ms) } / *NR slot length;* TL1-RSRP1, Tfirst\_target-PL-RS1, related to the unknown state and NM2, and Tfirst\_target-PL-RS2 to the known state

PL-RS (CSI-RS is used as PL-RS) are overlapped or adjacent:

* No requirements.

**Issue 4-1-7: For sDCI mTRP if dual TCI state is switched, if UE cannot support simultaneous DL reception in FR2, how to specify MAC CE based dual TCI state switch the switching delay requirements for Case 3?**

**Agreement**:

MAC CE based dual TCI state switch requirement:

FR1 and FR2 (SSB are not adjacent):

* THARQ + + max{TL1-RSRP1 +TOuk1\*(Tfirst-SSB1+ TSSB-proc), TL1-RSRP2 +TOuk2\*(Tfirst-SSB2+ TSSB-proc)} / *NR slot length*

FR2 (SSB are adjacent):

* Longer delay is expected or one SSB period is needed.

FFS on whether to define additional requirements if UE received PDSCH from single TRP.

UL MAC CE based dual TCI state switch requirement:

PL-RS are not overlapped or adjacent:

* THARQ + + max{ TL1-RSRP1 + Tfirst\_target-PL-RS1 + 4\*Ttarget\_PL-RS1 + 2ms, TL1-RSRP2 + Tfirst\_target-PL-RS2 + 4\*Ttarget\_PL-RS2 + 2ms } / *NR slot length*

PL-RS (CSI-RS is used as PL-RS) are overlapped or adjacent:

* No requirements.

**Issue 4-1-8: Applicability of sDCI mTRP**

**Agreement**:

Applicability of sDCI mTRP:

* Intra-cell only based on RAN1 conclusion.

**Issue 4-1-9: For sDCI mTRP, whether to specify RRM requirements for RRC based switching delay requirements?**

**Agreement**:

* For sDCI mTRP, not specify RRM requirements for RRC based switching delay requirements.

1. **Demod related:**

**WF on NR\_MIMO\_evo\_DL\_UL demod was approved in R4-2316920.**

**Issue 1-1-1: clarify if CSI requirements are needed for codebook enhancement for UE predicated PMI**

**Agreement:**

* Study the feasibility of introducing PMI reporting requirements with ‘typeII-Doppler-r18’ (FR1 only).
  + FFS for test metric
  + FFS for simulation assumptions

**Issue 1-1-2: clarify if demodulation or CSI requirements are needed for TDCP**

**Agreement:**

* Do not introduce PDSCH demodulation requirements for TDCP measurement.
* FFS on CSI requirements for TDCP measurement

**Issue 1-1-3: clarify performance impact for Unified TCI enhancement on multi-TRP**

**Agreement:**

* No performance impact on UE demodulation and CSI reporting for Unified TCI enhancement on multi-TRP.

**Issue 1-1-4: clarify if CSI requirements are needed for codebook enhancement for CJT**

**Agreement:**

* Study the feasibility of introducing PMI reporting requirements with ‘typeII-CJT-r18’ (FR1 FDD only).
  + Focus on 2TRP only
  + FFS for test metric
  + FFS for simulation assumptions

**Issue 1-1-5: clarify if demodulation requirements are needed for codebook enhancement for CJT**

**Agreement:**

* No demodulation requirements for codebook enhancement for CJT are needed.

**Issue 1-1-6: clarify if demodulation requirements are needed for increased number of orthogonal DMRS ports**

**Agreement:**

* Introduce PDSCH demodulation requirements for Rel-18 enhanced DMRS for SU-MIMO scenario. Select limited case(s) from the legacy PDSCH cases to reuse the test configurations, but change the DRMS port configuration to configure the new defined DMRS ports for no more than 4 DMRS ports
  + FFS for applicability rule to be defined that UE can skip the legacy case if UE has passed the case with the same configuration but using the new DMRS ports
  + Companies are encouraged to propose the test case(s) to be reused.

**Issue 1-2-1: clarify if BS demodulation requirements are needed for unified TCI framework extension**

**Agreement:**

* No BS demodulation requirements introduced for unified TCI framework extension

**Issue 1-2-2: clarify if BS demodulation requirements are needed for two TAs enhancement**

**Agreement:**

* No BS demodulation requirements introduced for two TAs enhancement

**Issue 1-2-3: clarify if BS demodulation requirements are needed for increased number of orthogonal DMRS ports**

**Agreement:**

* Introduce PUSCH demodulation requirements for Rel-18 enhanced DMRS ports. Select limited case(s) from legacy PUSCH cases to reuse the test configurations, but change the DRMS port configuration to configure the new defined DMRS ports for no more than 2 DMRS ports with introducing test applicability rule.
  + Applicability rule to be defined that BS can skip the legacy case if BS has passed the case with the same configuration but using new DMRS ports
  + Companies are encouraged to propose the test case(s) to be reused.

**Issue 1-2-4: clarify if BS demodulation requirements are needed for Uplink 8Tx transmission in Rel-18**

**Agreement:**

* Postpone the discussion on BS performance requirement introduction for Uplink 8Tx transmission to future release

**Issue 1-2-5: clarify if BS demodulation requirements are needed for FR2 STxMP**

**Agreement:**

* FFS on introducing BS demodulation requirements for FR2 STxMP
* Companies are encouraged to provide the view about testability of FR2 STxMP

**RAN4#109 November 13 – November 17 2023, Chicago, US**

The following agreements and conclusions were made in RAN4 #109:

1. **RF related:**

**CR to introduce configured transmitted power for STxMP was agreed in R4-2321727.**

**The RF core part of WI is completed**

- Add new symbols to allow relaxations to EIRP and MPR requirements due to support for simultaneous transmission to multiple directions.

- Limit the feature to the power classes targeting CPE/FWA/vehicle/Industrial devices only.

- Define EIRP requirements and configured transmitted power for simultaneous transmission to multiple directions.

**Reply LS on coherence between PUSCH and 8-ports SRS with partial dropping to R4-2318014 (R1-2310645) LS on coherence between PUSCH and 8-ports SRS with partial dropping was approved in R4-2321728.**

**RAN4 does not plan to come back to the issue until RAN4 has WI for 8Tx requirements.**

1. **RRM related:**

Agreement: RAN4 RRM work of the WI can be closed.

**WF on NR\_MIMO\_evo\_DL\_UL WI was approved in R4-2321615.**

**The following Draft CRs are endorsed:**

R4-2321500, Draft CR on L1-RSRP RRM requirements in R18 NR MIMO evolution, vivo

R4-2321501, Draft CR on MRTD requirements, Apple

R4-2321502, UL Transmit timing for MIMO Evolution, Ericsson

R4-2321614, DraftCR on MTTD requirements for UL multi-DCI multi-TRP with two TAs, Huawei, HiSilicon

R4-2321505, DraftCR on L1-RSRP measurement for cell with different PCI when actual timing offset can be larger than CP, xiaomi

R4-2321506, Draft CR on active downlink TCI state switching delay for unified TCI for sDCI mTRP, Samsung

R4-2321508, Draft CR for Active downlink TCI state switching delay for unified TCI for mDCI mTRP, Nokia, Nokia Shanghai Bell

R4-2321507, Draft CR on Active uplink TCI state switching delay for unified TCI for sDCI mTRP, Huawei, HiSilicon

R4-2321504, DraftCR on UL TCI state switching delay requirements for eUTCI for mDCI, Apple

**The Big CR to TS 38.133 on NR MIMO evolution for downlink and uplink was agreed in R4-2321644.**

**Issue 1-1-1: Is it feasible to define TDCP accuracy requirement for TDCP?**

**Agreement**:

* No RRM core requirement to be defined, and further discuss the following options:
  + Option 1: Define accuracy and test cases as part of performance requirement
  + Option 2: Do not define accuracy requirement but define test cases for particular configurations as part of performance requirements
  + Option 3: Do not define accuracy requirement and test cases as part of performance requirements

**Issue 2-1-1: TAG management for multi-TRP with 2 TAs**

**Agreement**:

* When the transmission timing difference between two TAGs for multi-TRP operation exceeds the MTTD value, no additional UE behaviour to be defined in RAN4.

**Issue 3-1-1: For sDCI mTRP, how to specify DL MAC CE based dual TCI state switch the switching delay requirements for Case 1, if SSB are adjacent in FR2?**

Agreement:

The SSB periodicity is the same for serving cell

* THARQ + + max{TOk1\*(Tfirst-SSB1 +AD1\*TSSB1+ TSSB-proc), TOk2\*(Tfirst-SSB2 +AD2\*TSSB2+ TSSB-proc)} / NR slot length
  + AD1 = 1 if SSBs are adjacent in FR2 and TSSB1 =TSSB2 ; 0 otherwise
  + AD2 = 1 if SSBs are adjacent in FR2 and TSSB2 = TSSB1 ; 0 otherwise

**Issue 3-1-2: For sDCI mTRP, how to specify DL MAC CE based dual TCI state switch the switching delay requirements for Case 2, if SSB are adjacent in FR2?**

Agreement:

* (TSSB1 = TSSB2): THARQ + + TL1-RSRP1 + max {TOuk1\*(Tfirst-SSB1+ AD1\*TSSB1 + TSSB-proc), TOk2\*(Tfirst-SSB2 + TSSB-proc)} / *NR slot length*; AD1 = 1 if SSBs are adjacent in FR2; 0 otherwise

**Issue 3-1-4: For sDCI mTRP, end point of dual TCI state switch delay requirements?**

Agreement:

* Dual TCI state switch requirements for sDCI are defined for the case when UE is expected to receive PDCCH/PDSCH from both TCI states/ TRPs after the switch.

**Issue 3-1-5 For sDCI mTRP, active TCI state list update delay**

Agreement:

* For the case of overlapping/adjacent SSB in FR2, additional SSB can be added in active TCI state list update delay

**Issue 3-1-7-a For mDCI mTRP, how to specify DL TCI state switching requirements for eUTCI if UE not supporting two TAs?**

**Agreement**:

* [Known]: THARQ + + TOk\*(Tfirst-SSB + TSSB-proc + OL\*TSSB)
* [Unknown]: THARQ + + TL1-RSRP + TOuk\*(Tfirst-SSB + TSSB-proc + OL\*TSSB)
* OL=1 if SSB overlaps or adjacent to SSB from other TRP in FR2 and SSB periodicity is less than that of other TRP, 0 otherwise

**Issue 3-1-7-b For mDCI mTRP, how to specify UL TCI state switching requirements for eUTCI if UE not supporting two TAs?**

**Agreement**:

* Rel-17 unified TCI state switching requirements are applicable for each TCI state associated with coresetPoolIndex independently

**Issue 3-1-8-a: For mDCI mTRP, how to specify DL TCI state switching requirements for eUTCI if UE supporting two TAs and but not supporting RTD>CP?**

**Agreement**:

* [Known]: THARQ + + TOk\*(Tfirst-SSB + TSSB-proc + OL\*TSSB)
* [Unknown]: THARQ + + TL1-RSRP + TOuk\*(Tfirst-SSB + TSSB-proc + OL\*TSSB)
* OL=1 if SSB overlaps or adjacent to SSB from other TRP in FR2 and SSB periodicity is less than that of other TRP, 0 otherwise

**Issue 3-1-9-a: For mDCI mTRP, how to specify DL TCI state switching requirements for eUTCI if UE supporting two TAs and supporting RTD>CP in FR1?**

**Agreement**:

* Rel-17 unified TCI state switching requirements are applicable for each TCI state associated with coresetPoolIndex independently

**Issue 3-1-10 For mDCI mTRP, active TCI state list update delay**

**Agreement**:

* For the case of overlapping/adjacent SSB in FR2, additional SSB can be added in active TCI state list update delay

**Issue 3-1-11: L1-RSRP measurement when RTD>CP**

**Agreement**:

* Define requirements for FR1 for intra/inter-cell.
* For FR1, if UE supports RTD>CP, reuse Rel-17 L1-RSRP measurement period in 9.13 for a cell with different PCI from serving cell, remove the RTD is smaller than CP side condition. Reuse L1-RSRP measurement period in 9.5 for serving cell.
* If UE does not support RTD>CP, for RTD is larger than CP, no requirements.
* FFS on scheduling/measurement restriction for different SCS and TDD.

**Issue 3-1-12: L1-RSRP measurement for resource type of mTRP for a cell with different PCI from serving cell**

**Agreement**:

* SSB only, no CSI-RS

1. **Demod related:**

**WF on [109][327] NR\_MIMO\_evo\_DL\_UL demod was approved in R4-2321141.**

**Issue 1-1-1: clarify criteria of feasibility for ‘typeII-Doppler-r18’ codebook**

**Agreement:**

* Define PMI reporting requirements with ‘typeII-Doppler-r18’ using option 2 if both option 1 and option 2 could be fulfilled. Otherwise, if only option 1 is fulfilled, further discuss if feasible to define PMI reporting requirement using option 1 only.
  + Option 1: UE throughput with ‘typeII-Doppler-r18’ codebook could outperform Rel-16 Type II codebook with the same CSI-RS configurations and medium/high UE speed.
  + Option 2: UE throughput with ‘typeII-Doppler-r18’ codebook could outperform random precoding based on Single Panel Type I codebook with the same CSI-RS configurations and medium/high UE speed.

**Issue 1-1-2: clarify test metric for PMI reporting requirements with ‘typeII-Doppler-r18’ codebook**

**Agreement:**

* Test metric defined as γ\_1=t\_(typeII-doppler)/t\_rnd as a starting point, where t\_(typeII-doppler) is X % (e.g. X=90) of the maximum throughput obtained at SNR\_(typeII-doppler) using the typeII-Doppler-r18 precoder configured according to the UE reports, and t\_rnd is the throughput measured at SNR\_(typeII-doppler) with random precoding based on Type I Single Panel codebook.

**Issue 1-1-3: clarify if CSI requirements are needed for TDCP**

**Agreement:**

* Do not introduce CSI requirements for TDCP measurement.

**Issue 1-1-4: clarify if PMI reporting requirements are needed for ‘typeII-CJT-r18’ codebook**

**Agreement:**

* Focus on co-located scenario (zero time offset and zero frequency offset), introduce PMI reporting requirements with ‘typeII-CJT-r18’ (FR1 FDD only) if performance gain could be observed, with Test metric defined as γ\_3=t\_(typeII-CJT)/t\_rnd , where t\_(typeII-CJT) is Z % (e.g., Z=90) of the maximum throughput obtained at SNR\_(typeII-CJT) using the precoders configured according to the UE reports, and t\_rnd is the throughput measured at SNR\_(typeII-CJT) with random precoding based on type I Single Panel codebook.

**Issue 1-1-5: clarify if applicability rules are needed for demodulation requirements of Rel-18 DMRS ports**

**Agreement:**

* Introduce applicability rules for UE to skip legacy case(s) if UE has passed the case(s) with same configuration using the Rel-18 DMRS ports.

**Issue 1-2-1: clarify the details of applicability rule for Rel-18 DMRS ports**

**Agreement:**

* Unless otherwise stated, PUSCH requirements with enhanced DM-RS port configuration shall apply only for a BS declaring support of enhanced DM-RS port type (see D.xxx in table 4.6-1).

|  |  |  |
| --- | --- | --- |
| D.xxx | PUSCH enhanced DM-RS port | Declaration of support PUSCH enhanced DM-RS port configuration enhanced-dmrs-Type\_r18. |

* [A BS that passes tests with enhanced DM-RS port can consider corresponding legacy PUSCH tests as passed. Definition of "corresponding" needs to be further specified.] FFS on specific wording.

**Issue 1-2-2: clarify if BS demodulation requirements are needed for FR2 STxMP**

**Agreement:**

* Do not define FR2 STxMP demodulation requirements in Rel-18, postpone the discussion on BS performance requirement introduction with UE FR2 STxMP to future release.

**Initial simulation assumptions for TypeII Doppler**

**Issue 2-1-1:** **Propagation channel**

**Way forward:**

* Start with TDLA30-30, TDLA30-50 and TDLA30-100 for TypeII Doppler feasibility study.

**Issue 2-1-2:** **Correlation configurations**

**Agreement:**

* Use 16 Tx with XP Medium for TypeII Doppler feasibility study.

**Issue 2-1-3:** **N1, N2, O1, O2 and the number of CSI-RS ports**

**Agreement:**

* Use 16Tx with (N1, N2) = (4, 2), (O1, O2) = (4, 4) for TypeII Doppler feasibility study.

**Issue 2-1-4:** **paramCombination-Doppler-r18**

**Agreement:**

* Set paramCombination-Doppler-r18 as 7 (L=4, pυ=1/2, β=1/2).
* Other options are not precluded.

**Issue 2-1-5:** **RI restriction (typeII-Doppler-RI‑Restriction-r18)**

**Agreement:**

* Set RI restriction as 0010 for TypeII Doppler feasibility study.

**Issue 2-1-6:** **N4 configuration**

**Agreement:**

* Simulate both N4=1 and N4=4 for feasibility study. FDD is in first priority for feasibility study due to configuration complexity in TDD.

**Issue 2-1-7: CSI-RS configuration**

**Agreement:**

* Aperiodic CSI-RS with 2 slots separation, [with 8ms CSI request triggering periodicity].

**Issue 2-1-8:** **K (number of NZP CSI-RS resources)**

**Agreement:**

* Set K=4 as a starting point.

**Issue 2-1-9:** **m (separation between two consecutive CSI-RS resources) and d (DD unit duration (in slots)**

**Agreement:**

* Set m and d as 2 as a starting point for N4=4.

**Issue 2-1-10:** **delta (slot associated with CSI report)**

**Agreement:**

* Set delta as 1.

**Issue 2-1-11:** **MCS**

**Agreement:**

* MCS13 (16QAM, 0.48) as a starting point.
* Other options are not precluded.

**Issue 2-1-12:** **other parameters**

**Agreement:**

* follow below table

|  |  |
| --- | --- |
| **Parameter** | **Value** |
| Channel bandwidth and subcarrier spacing | For FDD, 10MHz/15kHz  For TDD, 40MHz/30kHz |
| TDD DL-UL configuration | FR1.30-1 as specified in 38.101-4 Annex A. |
| Number of UE receiver antennas | 2 and 4 |
| R (numberOfPMI-SubbandsPerCQI-Subband-Doppler-r18) | 1 |
| Other Test parameters not mentioned above | For FDD 2Rx, Table 6.3.2.1.6-1 in 38.101-4  For TDD 2Rx, Table 6.3.2.2.6-1 in 38.101-4  For FDD 4Rx, Table 6.3.3.1.6-1 in 38.101-4  For TDD 4Rx, Table 6.3.3.2.6-1 in 38.101-4 |

* Other options are not precluded.

**Initial simulation assumptions for TypeII for CJT**

**Issue 2-2-1: Propagation channel and correlation configuration**

**Agreement:**

* Use TDLA30-10 with XP high as the propagation channel and correlation configuration for Rel-18 TypeII for CJT test.
* Other options are not precluded

**Issue 2-2-2: K (numberOfCSI-RS-Resources), NTRP (Number of TRPs) and restrictedCMR-Selection**

**Agreement:**

* Set K=2 CSI-RS resources, NTRP=2 TRPs and configure parameter *restrictedCMR-Selection* to restrict the number of selected CSI-RS resources is N=NTRP for Rel-18 TypeII for CJT PMI test.

**Issue 2-2-3: N1, N2, O1, O2 and the number of CSI-RS ports**

**Agreement:**

* Set PCSI-RS=8 CSI-RS ports per TRP with (N1, N2) = (4, 1), (O1, O2) = (4, 1) as a starting point for Rel-18 TypeII for CJT PMI test.

**Issue 2-2-6: RI restriction (typeII-CJT-RI‑Restriction-r18)**

**Agreement:**

* Set RI restriction as 0001 for Rel-18 TypeII for CJT PMI test.
* Other options are not precluded

**Issue 2-2-8:** **other parameters**

**Agreement:**

* follow below table

|  |  |
| --- | --- |
| **Parameter** | **Value** |
| Channel bandwidth and subcarrier spacing | For FDD, 10MHz/15kHz |
| TDD DL-UL configuration | FR1.30-1 as specified in 38.101-4 Annex A. |
| Number of UE receiver antennas | 2 and 4 |
| R (numberOfPMI-SubbandsPerCQI-Subband-Doppler-r18) | 1 |

**Test set-up and simulation assumptions for Rel-18 DMRS (UE side)**

**Issue 2-3-1: DMRS configuration type and length**

**Agreement:**

* Rel-18 DMRS configuration Type 1 with length 1

**Issue 2-3-3: Duplex mode for tests need to be defined for Rel-18 DMRS**

**Agreement:**

* both FDD and TDD

**Test set-up and simulation assumptions for Rel-18 DMRS (BS side)**

**Issue 3-1-1: DMRS ports**

**Agreement**:

* Rank 1 for 1Tx: {8}
* Rank 2 for 2Tx: {8,9}

**Issue 3-1-2: agreed parameters**

**Agreement**:

|  |  |  |
| --- | --- | --- |
| Parameter | | Value |
| Transform precoding | | Disabled |
| Waveform | | CP-OFDM |
| Channel Model | | TDLC300-100 |
| Antenna configuration | | 1Tx2Rx  2Tx2Rx |
| SCS | | 15 kHz SCS  30 kHz SCS |
| Default TDD UL-DL pattern (Note 1) | | 15 kHz SCS:  3D1S1U, S=10D:2G:2U  30 kHz SCS:  7D1S2U, S=6D:4G:4U |
| HARQ | Maximum number of HARQ transmissions | 4 |
|  | RV sequence | 0, 2, 3, 1 |
| DM-RS | DM-RS configuration type | 1 |
| DM-RS duration | single-symbol DM-RS |
| Additional DM-RS position | pos1 |
| Number of DM-RS CDM group(s) without data | 2 |
| Ratio of PUSCH EPRE to DM-RS EPRE | -3 dB |
| DM-RS port | {8}, {8, 9} |
| DM-RS sequence generation | NID0=0, nSCID =0 |
| DM-RS type | *enhanced-dmrs-Type\_r18* |
| Time domain | PUSCH mapping type | Both A and B |
| resource | Start symbol | 0 |
| assignment | Allocation length | 14 |
| Frequency domain resource | RB assignment | Full applicable test bandwidth |
| assignment | Frequency hopping | Disabled |
| TPMI index for 2Tx two-layer spatial multiplexing transmission | | 0 |
| Code block group based PUSCH transmission | | Disabled |
| NOTE 1: The same requirements are applicable to FDD and TDD with different UL-DL pattern. | | |

**Issue 3-1-5: PUSCH demodulation cases need to be defined for Rel-18 DMRS**

**Agreement**:

Cases for selected combination of CBW, SCS and PUSCH mapping type

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of RX antennas | Cyclic prefix | Propagation conditions and correlation matrix | Fraction of maximum throughput | MCS | Additional DM-RS position |
| 1 | 2 | Normal | TDLC300-100 Low | 70 % | TBD | pos1 |
| 2 | 2 | Normal | TDLC300-100 Low | 70 % | TBD | pos1 |

#### 2.4.2 Remaining Open issues

RAN4 completed the core work. Some remaining details will be completed during maintenance phase.

RRM Performance part:

* Whether to define TDCP accuracy or test case as part of performance part.
* RRM test cases

Demod Performance part:

* Simulation results alignment for TypeII Doppler codebook.
* Define PMI reporting requirement for TypeII Doppler codebook if feasibility verified.
* Simulation assumption and set-up alignment for TypeII CJT codebook.
* Simulation results alignment for TypeII CJT codebook.
* Define PMI reporting requirement for TypeII CJT codebook if feasibility verified.
* Simulation assumption and simulation results alignment for Rel-18 DMRS.
* Define PDSCH and PUSCH demodulation requirements for Rel-18 DMRS.

## 2.5 RAN5

n/a

#### 2.5.1 Agreements

#### 2.5.2 Remaining Open issues

#### 2.5.3 Remaining Open issues with cross-WG dependencies

## 2.6 RAN6

n/a

#### 2.6.1 Agreements

#### 2.6.2 Remaining Open issues

## 3. Detailed progress in SA/CT WGs since last TSG meeting (for all involved WGs)

NOTE: This section only needs to be filled in for WI/SIs where there is a corresponding relevant WI/SI in SA/CT.

n/a

## 3.1 SAx/CTs

#### 3.1.1 Agreements with cross-TSG impacts

#### 3.1.2 Remaining Open issues with cross-TSG impacts

NOTE: This section should also flag any critical dependencies that need TSG attention.

## 4. References

NOTE: This can be e.g. a list of all related Tdocs in the affected WGs since last TSG, references to LSs, produced TRs/TSs, the work/study item description or status reports of previous TSGs.

v04.81 31.07.2018 simplification of template and addition of cross-TSG aspects

v04.80 21.05.2018 minor adaptations for RAN #80

v04.79 26.02.2018 minor adaptations for RAN #79

v04.78 18.11.2017 minor adaptations for RAN #78

v04.77 06.08.2017 minor adaptations for RAN #77

v04.76 15.05.2017 minor adaptations for RAN #76

v04.75 31.01.2017 minor adaptations for RAN #75

v04.74 28.10.2016 minor adaptations for RAN #74

v04.73 01.09.2016 adaptations for RAN #73 (time units in extra Excel table, RAN6 reporting included)

v04.72 26.05.2016 adaptations for RAN #72 (introduction of NR & GERAN TUs)

v04.71 10.02.2016 minor adaptations for RAN #71

v04.70 30.10.2015 minor adaptations for RAN #70

v04.69 12.08.2015 minor adaptations for RAN #69

v04.68 21.05.2015 minor adaptations for RAN #68

v04.67 01.02.2015 minor adaptations for RAN #67

v04.66 16.11.2014 minor adaptations for RAN #66

v04.65 16.08.2014 minor adaptations for RAN #65

v04.64 22.05.2014 minor adaptations for RAN #64

v04.63 24.01.2014 restructuring for RAN #63 to cover Core & Perf. in one doc file

v03.62 11.11.2013 section 1.2.3 adapted for RAN #62

v03 11.08.2013 section 1.2.3 added on time budget

v02 07.05.2010 history added, some spelling corrections

v01 13.11.2009 First version of the template