**3GPP TSG RAN WG1 #109-e R1-2205316**

**e-Meeting, May 9th – 20th, 2022**

**Agenda item:** **8.1.1**

**Source: Moderator (ZTE)**

**Title: Endorsed TPs for Maintenance on Rel-17 Multi-Beam**

**Document for:** **Discussion and Decision**

1. **Introduction**

In this contribution, we summarize the endorsed TPs (i.e., TP#1-5, TP#1-13, TP#1-19, TP#2-4, TP#2-5, TP#2-8, TP#4-1, and TP#1-11) in [1].

1. **Summary of endorsed TPs**

### **TP#1-5 in TS38.213**

**Reason of change:**

The current spec does not well capture the following agreement in RAN1-108 e-meeting. It should be any one SRS resource from the SRS resource set, instead of the first one as in current spec.

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| **RAN1-108 e-meeting Agreements**On Rel-17 unified TCI framework, for any SRS resource or resource set that does not share the same indicated Rel-17 TCI state(s) as dynamic-grant/configured-grant based PUSCH and all of dedicated PUCCH resources, but can be configured as a target signal of a Rel-17 UL or, if applicable, joint TCI (hence the Rel-17 UL or, if applicable, joint TCI state pool), Rel-17 mechanism(s) which reuse mechanisms similar to the Rel-15/16 spatial relation info update signaling/configuration design(s) are used to update/configure such SRS (s) with Rel-17 UL or, if applicable, joint TCI state(s).* Including inter-cell case, where SSB with PCI different from the serving cell can be used as a source RS in Rel-17 UL, or if applicable joint, TCI state for these SRS resources
* The UL PC parameter setting (including PL-RS) for the SRS resource set should be derived based on the setting associated with TCI indicated for the SRS resource with the lowest SRS-ResourceId in that SRS resource set
* The MAC-CE signaling for the Rel-17 mechanism(s) to update the spatial relation of the AP/SP-SRS not sharing the indicated Rel-17 TCI state shall provide an ID of Rel-17 UL or, if applicable, joint TCI state instead of an RS resource ID for each AP/SP-SRS resource
	+ Reuse other aspects of the MAC-CE for the Rel-15/16 spatial relation info update (including 'SP SRS Activation/Deactivation MAC CE', 'Enhanced SP/AP SRS Spatial Relation Indication MAC CE', and 'Serving Cell Set based SRS Spatial Relation Indication MAC CE')
		- Note:  The exact details are up to RAN2.
* Note: A Rel-17 UE is not required to support both this feature and optional Rel-16 features of SRS spatial relation info within the same band.
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**Summary of change:**

1. Generalize the SRS resource without restriction of “first”.
2. PL-RS refers to the one associated with or included in the DLorJoint-TCIState or UL-TCIState of an SRS resource with lowest SRS-ResourceId in the SRS resource set, instead of the indicated DLorJoint-TCIState or UL-TCIState.

**Consequence if not approved:**

The spec is not aligned with the agreement.

**TP 1-5**: To endorse the following text proposal for TS 38.213:

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| **7 Uplink Power control**< Unchanged parts are omitted >- in clause 7.3.1, if *p0-Alpha-CLID-SRS-Set* is provided- if *useIndicatedTCIState* is provided for a SRS resource set, the values of $P\_{O\\_SRS,b,f,c}\left(q\_{s}\right)$, $α\_{SRS,b,f,c}\left(q\_{s}\right)$, and SRS power control adjustment state $l$ are provided by *p0-Alpha-CLID-SRS-Set* associated with the indicated *DLorJoint-TCIState* or *UL-TCIState*- else, if *useIndicatedTCIState* is not provided for a SRS resource set and for a ~~first~~ SRS resource from the SRS resource set, the values of $P\_{O\\_SRS,b,f,c}\left(q\_{s}\right)$, $α\_{SRS,b,f,c}\left(q\_{s}\right)$, and SRS power control adjustment state $l$ are provided by *p0-Alpha-CLID-SRS-Set* associated with *DLorJoint-TCIState* or *UL-TCIState* of an SRS resource with lowest *SRS-ResourceId* in the SRS resource set and a RS index $q\_{d}$ for obtaining a pathloss estimate for the SRS transmission is provided by PL-RS associated with or included in the ~~indicated~~ *DLorJoint-TCIState* or *UL-TCIState* of an SRS resource with lowest *SRS-ResourceId* in the SRS resource set< Unchanged parts are omitted > |

### **TP#1-13 in TS38.213**

**Reason of change:**

The current spec does not well capture the following agreements.

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| In RAN1#107-e and RAN1#108-e meetings, following agreements were achieved for Rel-17 unified TCI.**Agreement**On Rel-17 unified TCI framework, for intra-cell beam management, after X symbols from the UE receives the BFRR from NW, the UE assumes the same QCL parameter as the ones associated with the index q new for all PDSCH /PDCCH receptions in a CC, as well as other signals/channels configured to sharing the same indicated Rel-17 TCI state as PDSCH /PDCCH reception.* The above applies to Rel-15 SpCell BFR , Rel-16 CBRA based SpCell BFR , and Rel-16 SCell BFR
* Note: q new is a candidate beam identified by the UE in set q1. q1 is the set of candidate beams

AgreementThe reply LS to RAN2 on feMIMO RRC parameters is endorsed in R1-2202720.In R1-2202720, RAN1 confirmed that“QCL per an aperiodic resource set is currently configured i.e. all resource within NZP-CSI-RS resource set follow unified TCI state in DCI”.  |

The agreements above mean that all resources in an aperiodic CSI-RS resource set should share same indicated TCI state as for the PDCCH and PDSCH for Rel-17 unified TCI.

However, the above agreements are not accurately captured in Clause 6 of 3GPP TS38.213 v17.1.0, e.g., the resources that can share a same indicated TCI state as for the PDCCH and PDSCH are defined as “aperiodic CSI-RS in a resource from a CSI-RS resource set”, or “aperiodic CSI-RS resource in a CSI-RS resource set”. This kind of descriptions may lead to different understandings.

**Summary of change:**

Clarify that the CSI-RS should be aperiodic CSI-RS resource in a CSI-RS resource set.

**Consequence if not approved:**

The spec may lead to different understandings.

**TP 1-13**: To endorse the following text proposal for TS 38.213:

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| **6 Link recovery procedures**< Unchanged parts are omitted >If a UE is provided *TCI-State\_r17* indicating a unified TCI state for the PCell or the PSCell [6, TS 38.214], after X 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 *AdditionalPCIInfo* is not provided, monitors PDCCH in all CORESETs, and receives PDSCH and aperiodic CSI-RS ~~in a~~ resource ~~from~~ 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 $q\_{new}$, if any- transmits PUCCH, PUSCH and SRS that uses a same spatial domain filter with same indicated TCI state as for the PUCCH and the PUSCH, using a same spatial domain filter as for the last PRACH transmission< Unchanged parts are omitted >If a UE is provided *TCI-State\_r17* indicating a unified TCI state for the PCell or the PSCell and the UE provides BFR MAC CE in Msg3 or MsgA of contention based random access procedure, after X 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 *AdditionalPCIInfo* 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 $q\_{new}$, if any- transmits PUCCH, PUSCH and SRS that uses a same spatial domain filter with same indicated TCI state as for the PUCCH and PUSCH, using a same spatial domain filter as for the last PRACH transmission< Unchanged parts are omitted >If a UE is provided *TCI-State\_r17* indicating a unified TCI state, after X 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- monitors PDCCH in all CORESETs, and receives PDSCH and aperiodic CSI-RS ~~in a~~ resource ~~from~~ in a CSI-RS resource set using the same antenna port quasi co-location parameters as the ones associated with the corresponding index $q\_{new}$, if any- transmits PUCCH, PUSCH and SRS that uses a same spatial domain filter with same indicated TCI state as for the PUCCH and PUSCH, using a same spatial domain filter as the one corresponding to $q\_{new}$, if any< Unchanged parts are omitted > |

### **TP#1-19 in TS38.213**

**Reason of change:**

As part of the link recovery procedure, the UE may be configured with a set of periodic CSI-RS resource configuration indexes. If the UE is not configured with periodic CSI-RS resources, the UE monitors the RSs in the TCI state for the respective CORESETs:

Excerpt from 38.213, clause 6:

If the UE is not provided $\overbar{q}\_{0}$ by *failureDetectionResourcesToAddModList* for a BWP of the serving cell, the UE determines the set $\overbar{q}\_{0}$ to include periodic CSI-RS resource configuration indexes with same values as the RS indexes in the RS sets indicated by *TCI-State* for respective CORESETs that the UE uses for monitoring PDCCH.

<omitted>

Here we note that since *TCI-State* is written in italics, it refers to the RRC field with the same name. However, when the UE is configured with the Rel-17 TCI framework, the UE does not derive any QCL source from a Rel-15 TCI state: those are provided in a *DLorJointTCIState.* We propose to clarify this, simply by adding ‘or *DLorJointTCIState’* to the excerpt above.

**Summary of change:**

Clarify that the UE may determine the set $\overbar{q}\_{0} $from a *DLorJointTCIState* in addition to a TCI-State*.*

**Consequence if not approved:**

BFD may not work well when the UE is configured with the Rel-17 TCI framework.

**TP 1-19**: To endorse the following text proposal for TS 38.213:

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| **6 Link recovery procedures**< Unchanged parts are omitted >If the UE is not provided $\overbar{q}\_{0}$ by *failureDetectionResourcesToAddModList* for a BWP of the serving cell, the UE determines the set $\overbar{q}\_{0}$ to include periodic CSI-RS resource configuration indexes with same values as the RS indexes in the RS sets indicated by *TCI-State* or *DLorJointTCIState* for respective CORESETs that the UE uses for monitoring PDCCH. If the UE is not provided $\overbar{q}\_{0,0}$ or $ \overbar{q}\_{0,1}$ for a BWP of the serving cell, the UE determines the set $\overbar{q}\_{0,0}$ or $ \overbar{q}\_{0,1}$ to include periodic CSI-RS resource configuration indexes with same values as the RS indexes in the RS sets indicated by *TCI-State* for first and second CORESETs that the UE uses for monitoring PDCCH, where the UE is provided two coresetPoolIndex values 0 and 1 for the first and second CORESETs, or is not provided coresetPoolIndex value for the first CORESETs and is provided coresetPoolIndex value of 1 for the second CORESETs, respectively. If there are two RS indexes in a TCI state, the set $\overbar{q}\_{0}$ or $\overbar{q}\_{0,0}$, or $\overbar{q}\_{0,1}$ includes RS indexes configured with *qcl-Type* set to 'typeD' for the corresponding TCI states. If a CORESET that the UE uses for monitoring PDCCH includes two TCI states and the UE is provided *sfnSchemePdcch* set to 'sfnSchemeA' or 'sfnSchemeB', the set $\overbar{q}\_{0}$ includes RS indexes in the RS sets associated with the two TCI states. The UE expects the set $\overbar{q}\_{0}$ to include up to two RS indexes. If the UE is provided $\overbar{q}\_{0,0}$ or $\overbar{q}\_{0,1}$, the UE expects the set $\overbar{q}\_{0,0}$ or the set $\overbar{q}\_{0,1}$ to include up to a number of $N\_{BFD}$ RS indexes indicated by *capabilityparametername*. If the UE is not provided $\overbar{q}\_{0,0}$ or $\overbar{q}\_{0,1}$, and if a number of active TCI states for PDCCH receptions in the first or second CORESETs is larger than $N\_{BFD}$, the UE determines the set $\overbar{q}\_{0,0}$ or $\overbar{q}\_{0,1}$ to include periodic CSI-RS resource configuration indexes with same values as the RS indexes in the RS sets associated with the active TCI states for PDCCH receptions in the first or second CORESETs corresponding to search space sets according to an ascending order for monitoring periodicity. If more than one first or second CORESETs correspond to search space sets with same monitoring periodicity, the UE determines the order of the first or second CORESETs according to a descending order of a CORESET index.  |

### **TP#2-4 in TS38.214**

**Reason of change:**

In current spec, the higher layer parameter *additionalPCI-r17* doesn’t align with those in TS38.214 to specify the different physical cell ID with which the activated TCI states corresponding to two *coresetPoolIndex* can be associated.

**Summary of change:**

In section 5.1.5 of TS 38.214, update the parameter *NumberOfAdditionalPCI*.

**Consequences if not approved:**

Higher-layer parameter misalignment between 38.214 and 38.331.

**TP 2-4**: To endorse the following text proposal for TS 38.214:

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| **5.1.5 Antenna ports quasi co-location**< Unchanged parts are omitted >* If the UE is configured with ~~[~~*~~NumberOfAdditionalPCI~~*~~]~~ *SSB-MTC-AddtionalPCI-r17* and with *PDCCH-Config* that contains two different values of *coresetPoolIndex* in *ControlResourceSet*, the UE receives an activation command for CORESET associated with each *coresetPoolIndex*, as described in clause 6.1.3.14 of [10, TS 38.321], used to map up to 8 TCI states to the codepoints of the DCI field *'Transmission Configuration Indication'* in one CC/DL BWP. When a set of TCI state IDs are activated for a *coresetPoolIndex*, the activated TCI states corresponding to one *coresetPoolIndex* can be associated with one physical cell ID and activated TCI states corresponding to another *coresetPoolIndex* can be associated with another physical cell ID.

< Unchanged parts are omitted > |

### **TP#2-5 in TS38.214**

**Reason of change:**

The mapping rule captured in the current version is misaligned with the latest version of RRC parameters.

**Summary of change:**

In TS38.214 section 5.2.1.4.3, clarify the mapping rule between SSB index and PCI index for inter-cell L1-RSRP measurement.

**Consequences if not approved:**

It is unclear how to determine the mapping rule between the SSB index and PCI index.

**TP 2-5**: To endorse the following text proposal for TS 38.214:

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| **5.2.1.4.3 L1-RSRP Reporting**< Unchanged parts are omitted >When the UE is configured with *SSB-MTC-AddtionalPCI-r17*~~[~~*~~NumberOfAdditionalPCI~~*~~]~~, a CSI-SSB-ResourceSet configured for L1-RSRP reporting includes one ~~or more~~ set~~s~~ of SSB indices and one set of PCI indices, where each SSB index is associated with a PCI index. ~~PCI indices are associated with the sets of SSB indices, respectively.~~ < Unchanged parts are omitted > |

### **TP#2-8 in TS38.214**

**Reason of change:**

In current spec, the higher layer parameter *additionalPCI-r17* doesn’t align with those in TS38.214 to specify the different physical cell ID with which the activated TCI states corresponding to two *coresetPoolIndex* can be associated.

**Summary of change:**

In section 5.1.5 of TS 38.214, update the parameter *NumberOfAdditionalPCI*.

**Consequences if not approved:**

Higher-layer parameter misalignment between 38.214 and 38.331.

 **TP 2-8**: To endorse the following text proposal for TS 38.214:

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| **5.2.1.4.3 L1-RSRP Reporting**\*\*\* Unchanged text is omitted \*\*\*When the UE is configured with SSB-MTC-AddtionalPCI-r17~~[NumberOfAdditionalPCI ]~~, a CSI-SSB-ResourceSet configured for L1-RSRP reporting includes one or more sets of SSB indices where PCI indices are associated with the sets of SSB indices, respectively.\*\*\* Unchanged text is omitted \*\*\* |

### **TP#4-1 in TS38.214**

**Reason for change:**

In current spec, the higher layer parameter *cri-RSRP-CapabilityIndex-r17* does not align with those in TS38.214 to specify the panel information for uplink panel selection.

**Summary of change:**

In section 5.2.1.4.3 of TS 38.214, update the parameter *cri-RSRP-Capability[Set]Index*.

**Consequences if not approved:**

Higher-layer parameter misalignment between 38.214 and 38.331.

**TP 4-1**: To endorse the following text proposal for TS 38.214:

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| **5.2.1.4 Reporting configurations**\*\*\* Unchanged text is omitted \*\*\*A CSI Reporting Setting is said to have a wideband frequency-granularity if-    reportQuantity is set to 'cri-RI-PMI-CQI', or 'cri-RI-LI-PMI-CQI', cqi-FormatIndicator is set to 'widebandCQI ' and pmi-FormatIndicator is set to 'widebandPMI ', or-    reportQuantity is set to 'cri-RI-PMI-CQI', or 'cri-RI-LI-PMI-CQI', codebookType is set to 'typeII-PortSelection-r17' with M=1 and cqi-FormatIndicator is set to 'widebandCQI ', or-    reportQuantity is set to 'cri-RI-i1' or-    reportQuantity is set to 'cri-RI-CQI' or 'cri-RI-i1-CQI' and cqi-FormatIndicator is set to 'widebandCQI ', or-    reportQuantity is set to 'cri-RSRP' or 'ssb-Index-RSRP' or 'cri-SINR', or 'ssb-Index-SINR' or 'cri-RSRP-Capability~~[Set]~~Index' or 'ssb-Index-RSRP-Capability~~[Set]~~Index' or 'cri-SINR-Capability~~[Set]~~Index', or 'ssb-Index-SINR-Capability~~[Set]~~Index' \*\*\* Unchanged text is omitted \*\*\* |

### **TP#1-11 in TS38.214**

**Reason for change:**

Directly applying the indicated *DLorJointTCIState* and/or *UL-TCIState* in the activation command, if only one TCI codepoint is activated in MAC-CE level, has been agreed. But, in the current spec, the corresponding UE behavior is missing.

**Summary of change:**

In section 5.1.5 of TS 38.214, capture the UE behavior in the case that the activation command maps *DLorJointTCIState* and/or *UL-TCIState* to only one TCI codepoint.

**Consequences if not approved:**

UE behaviour of mapping *DLorJointTCIState* and/or *UL-TCIState* to only one TCI codepoint is unclear.

**TP 4-1**: To endorse the following text proposal for TS 38.214:

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| **5.1.5 Antenna ports quasi co-location**\*\*\* Unchanged text is omitted \*\*\*The UE receives an   activation command, as described in clause 6.1.3.14 of [10, TS 38.321] or 6.1.3.x of [10, TS   38.321], used to map up to 8 TCI states and/or pairs of TCI states, with one   TCI state for DL channels/signals and one TCI state for UL channels/signals   to the codepoints of the DCI field 'Transmission Configuration   Indication' for one or for a set of CCs /DL BWPs , and if   applicable, for one or for a set of CCs /UL BWPs . When a set of TCI state   IDs are activated for a set of CCs /DL BWPs and if applicable, for a set of   CCs /UL BWPs , where the applicable list of CCs is determined by the   indicated CC in the activation command, the same set of TCI state IDs are   applied for all DL and/or UL BWPs in the indicated CCs . If the activation command maps DLorJointTCIState and/or UL-TCIState to only one TCI codepoint, UE shall apply the indicated DLorJointTCIState and/or UL-TCIState in the activation command for one or for a set of CCs /DL BWPs, and if applicable, for one or for a set of CCs /UL BWPs once the indicated mapping for the one single TCI codepoint is applied as described in [TS 38.133].\*\*\* Unchanged text is omitted \*\*\* |

1. **References**
2. R1-2205315, Moderator Summary #0 for Maintenance on Rel-17 Multi-Beam, ZTE