**3GPP TSG RAN WG1 #109-e R1-2205630**

**e-Meeting, May 9th – 20th, 2022**

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

**Source: Moderator (ZTE)**

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

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

1. **Introduction**

In this contribution, we summarize the further endorsed TPs (i.e., TP#1-1, TP#2-7 and TP#3-10) in [1].

1. **Summary of endorsed TPs**

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

**Reason for change:**

If a UE is provided *TCI-State\_r17* indicating a unified TCI state, after BFR is assumed as successful, UE transmits PUCCH, PUSCH and SRS that uses a same spatial domain filter as that for the last PRACH transmission or use a same spatial domain filter as the one corresponding to , if any. But there are following issues:

1. Value of X is not determined. We suggest X to be 28 symbol as legacy BFR procedures.
2. Power control scheme is not specified.

**Summary of change:**

First of all, X=28. Then, PL-RS can still be determined by . After that, UL power control parameters including PL-RS, P0/alpha for PUSCH and SRS, P0 for PUCCH, and closed loop power control, are determined: Values of P0, alpha and *l* for PUSCH, PUCCH and SRS can be determind by *p0-Alpha-CLID-PUSCH-Set*, *p0-Alpha-CLID-PUCCH-Set*, and *p0-Alpha-CLID-SRS-Set* associated with the lowest value of *ul-powercontrolId-r17* configured for the BFR related serving cell (PCell, PSCell, or a serving cell )

**Consequences if not approved:**

UL power control setting for PUSCH/PUCCH/SRS after receiving gNB response is unclear.

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

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| **6 Link recovery procedures**  <Unchanged part 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~~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 *AdditionalPCIInfo* is not provided, monitors PDCCH in all CORESETs, and receives PDSCH and aperiodic CSI-RS in a resource from 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 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. A power parameter is determined with:  - the RS index for obtaining the downlink pathloss estimate for PUSCH, PUCCH, and SRS transmission  - the values of , , and the PUSCH power control adjustment state are provided by *p0-Alpha-CLID-PUSCH-Set* associated with the lowest value of *ul-powercontrolId-r17* configured for the PCell or the PSCell  - the values of and the PUCCH power control adjustment state are provided by *p0-Alpha-CLID-PUCCH-Set* associated with the lowest value of *ul-powercontrolId-r17* configured for the PCell or the PSCell  - the values of , , and SRS power control adjustment state are provided by *p0-Alpha-CLID-SRS-Set* associated with the lowest value of *ul-powercontrolId-r17* configured for the PCell or the PSCell  <Unchanged part 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~~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 *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 , 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. A power parameter is determined with:  - the RS index for obtaining the downlink pathloss estimate for PUSCH, PUCCH, and SRS transmission  - the values of , , and the PUSCH power control adjustment state are provided by *p0-Alpha-CLID-PUSCH-Set* associated with the lowest value of *ul-powercontrolId-r17* configured for the PCell or the PSCell  - the values of and the PUCCH power control adjustment state are provided by *p0-Alpha-CLID-PUCCH-Set* associated with the lowest value of *ul-powercontrolId-r17* configured for the PCell or the PSCell  - the values of , , and SRS power control adjustment state are provided by *p0-Alpha-CLID-SRS-Set* associated with the lowest value of *ul-powercontrolId-r17* configured for the PCell or the PSCell  <Unchanged part omitted>  If a UE is provided *TCI-State\_r17* indicating a unified TCI state, after ~~X~~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  - monitors PDCCH in all CORESETs, and receives PDSCH and aperiodic CSI-RS in a resource from 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 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 , if any. A power parameter is determined with:  - the RS index for obtaining the downlink pathloss estimate for PUSCH, PUCCH, and SRS transmission  - the values of , , and the PUSCH power control adjustment state are provided by *p0-Alpha-CLID-PUSCH-Set* associated with the lowest value of *ul-powercontrolId-r17* configured for the corresponding SCell  - the values of and the PUCCH power control adjustment state are provided by *p0-Alpha-CLID-PUCCH-Set* associated with the lowest value of *ul-powercontrolId-r17* configured for the corresponding SCell  - the values of , , and SRS power control adjustment state are provided by *p0-Alpha-CLID-SRS-Set* associated with the lowest value of *ul-powercontrolId-r17* configured for the corresponding SCell  <Unchanged part omitted> |

### **TP#2-7 in TS38.214**

**Reason for change:**

In current spec of TS 38.214, SSB having a PCI different from the serving cell can be a source RS for CSI-RS for BM. However, it should be applicable for periodic TRS as well. Otherwise, inter BM will not be able to support control and data reception from an additional cell.

**Summary of change:**

On inter-cell beam management, the following QCL Types should be additionally supported:

* For a TCI state configured for periodic TRS,
  + SS/PBCH block associated with additional PCI w.r.t. QCL-TypeC + the same SS/PBCH w.r.t. QCL-TypeD
  + SS/PBCH block associated with additional PCI w.r.t. QCL-TypeC + CSI-RS for BM w.r.t. QCL-TypeD
* For a TCI state configured for CSI-RS for CSI,
  + TRS w.r.t. QCL-TypeA + SS/PBCH block associated with additional PCI w.r.t. QCL-TypeD

**Consequences if not approved:**

Using SSB from TRP with additional PCI from serving cell as a reference RS is unclear in QCL chain for TCI configuration.

**TP 2-7**: To endorse the following text proposal for TS 38.214:

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| **5.1.5 Antenna ports quasi co-location in TS 38.214**  <Unchanged Parts omitted>  For a periodic CSI-RS resource in an *NZP-CSI-RS-ResourceSet* configured with higher layer parameter *trs-Info*, the UE shall expect that a TCI-State indicates one of the following quasi co-location type(s):  - 'typeC' with an SS/PBCH block and, when applicable, 'typeD' with the same SS/PBCH block, where SS/PBCH block may have a PCI different from the PCI of the serving cell. The UE can assume center frequency, SCS, SFN offset are the same for SS/PBCH block from the serving cell and SS/PBCH block having a PCI different from the serving cell, or  - 'typeC' with an SS/PBCH block and, when applicable,'typeD' with a CSI-RS resource in an *NZP-CSI-RS-ResourceSet* configured with higher layer parameter *repetition*, where SS/PBCH block may have a PCI different from the PCI of the serving cell. The UE can assume center frequency, SCS, SFN offset are the same for SS/PBCH block from the serving cell and SS/PBCH block having a PCI different from the serving cell.  <Unchanged Parts omitted>  For a CSI-RS resource in an *NZP-CSI-RS-ResourceSet* configured without higher layer parameter *trs-Info* and without the higher layer parameter *repetition*, the UE shall expect that a TCI-State indicates one of the following quasi co-location type(s):  - 'typeA' with a CSI-RS resource in a *NZP-CSI-RS-ResourceSet* configured with higher layer parameter *trs-Info* and, when applicable, 'typeD' with the same CSI-RS resource, or  - 'typeA' with a CSI-RS resource in a *NZP-CSI-RS-ResourceSet* configured with higher layer parameter *trs-Info* and, when applicable, 'typeD' with an SS/PBCH block, where SS/PBCH block may have a PCI different from the PCI of the serving cell. The UE can assume center frequency, SCS, SFN offset are the same for SS/PBCH block from the serving cell and SS/PBCH block having a PCI different from the serving cell, or  - 'typeA' with a CSI-RS resource in a *NZP-CSI-RS-ResourceSet* configured with higher layer parameter *trs-Info* and, when applicable, 'typeD' with a CSI-RS resource in a *NZP-CSI-RS-ResourceSet* configured with higher layer parameter *repetition*, or  - 'typeB' with a CSI-RS resource in a *NZP-CSI-RS-ResourceSet* configured with higher layer parameter *trs-Info* when 'typeD' is not applicable. |

### **TP#3-10 in TS38.214**

**Reason for change:**

It is specified that BAT is counted from PUCCH with HARQ-ACK. However, in case that HARQ-ACK is conveyed on PUSCH (i.e. UCI on PUSCH), the current text is not clear whether BAT is counted from the last symbol of the PUSCH.

**Summary of change:**

Adding the case that HARQ-ACK is conveyed on PUSCH, i.e., UCI on PUSCH.

**Consequences if not approved:**

TCI application timing is unclear for the case the HARQ-ACK is conveyed on PUSCH.

**TP 3-10**: 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>  When the UE would transmit the last symbol of a PUCCH with HARQ-ACK information or a PUSCH with HARQ-ACK information corresponding to the DCI carrying the TCI State indication and without DL assignment, or corresponding to the PDSCH scheduling by the DCI carrying the TCI State indication, and if the indicated TCI State is different from the previously indicated one, the indicated *DLorJointTCIState* or *UL-TCIstate* should be applied starting from the first slot that is at least symbols after the last symbol of the PUCCH or the PUSCH. The first slot and the symbols are both determined on the carrier with the smallest SCS among the carrier(s) applying the beam indication.  <Unchanged parts are omitted> |

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