**3GPP TSG-RAN WG4 Meeting #104-e R4-2212689**

**Electronic Meeting, August 15 – August 26, 2022**

**Title:** LS on active TCI state list for UL TCI

**Response to:**

**Release:** Rel-17

**Work Item:** NR\_feMIMO-Core

**Source:** RAN WG4

**To:** RAN WG1/WG2

**Cc:**

**Contact Person:**

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**Attachments:**

**1. Overall Description:**

In RAN4 #103-e and RAN4 #104-e meetings, RAN4 has discussed UL TCI state switching delay requirements for unified TCI. The delay requirements are based on whether the pathloss reference RS in the TCI state is maintained or not.

In RAN1 #105, it’s agreed that The UE maintains the PL-RS of the activated UL TCI state or (if applicable) joint TCI state, which is as follows:

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| --- |
| **Agreement**  On path-loss measurement for Rel.17 unified TCI framework, a PL-RS (configured for path-loss calculation) is either included in UL TCI state or (if applicable) joint TCI state or associated with UL TCI state or (if applicable) joint TCI state.   * Whether a UE supports “beam misalignment or not” (detailed definition FFS) between the DL source RS in the UL or (if applicable) joint TCI state to provide spatial relation indication and the PL-RS is a UE capability   + Note: The term “beam misalignment” is for discussion purpose only * Whether it is ‘included in’ or ‘associated with’ (including the manner it is performed and the signaling) is up to RAN2 * The UE maintains the PL-RS of the activated UL TCI state or (if applicable) joint TCI state * The maximum number of activated UL TCI states or (if applicable) joint TCI states per band per cell is a UE capability * FFS: detailed aspects of PL-RS, e.g. CSI-RS type(s), restriction on configuration * FFS: For the definition of “beam misalignment or not”, at least consider the case where the periodic DL source RS in the UL or (if applicable) joint TCI state to provide spatial relation indication is configured/associated as the PL-RS * Note: PL-RS is assumed to be periodic |

RAN1 agreed that UE shall maintain path loss reference RS for up to 4 activated UL (or Joint) TCI states, but the number of active UL TCI states can be up to 8 based on UE capability. If the number of UL (or joint) TCI states in active TCI list is > 4, the UE behavior for maintaining the pathloss reference RS is unclear. maintained reference RS

In 38.213 section 7.1, the UE behavior is defined when UE is provided with more than 4 RS :

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| --- |
| If the UE is provided a number of RS resources for pathloss estimation for PUSCH/PUCCH/SRS transmissions that is larger than 4, the UE maintains for pathloss estimation RS resources corresponding to RS resource indexes as described in clauses 7.1.1, 7.2.1, and 7.3.1. |

UE will maintain pathloss estimation corresponding to RS resource indexes . However, it’s not clear what’s the relationship between and active TCI state list.

RAN4 would like clarification from RAN1/2 on maintained pathloss reference RS.

[Question 1: what’s the relationship between and active TCI state list?]

Question 2: Is UE expected to maintain the pathloss RS in the active UL (or joint) TCI list

Question 3: What is the UE behavior when number of active UL (or joint) TCI states is > 4

~~This causes some ambiguity as there is no RAN4 has to define requirements for what UE does when it's requested to use (UL or Joint) TCI state for which UE has or has not maintained the PL-RS:~~

1. ~~If UE maintains the PL-RS of the active UL TCI state (or joint) TCI state as per the RAN1 agreement, does the UE maintain all of PL-RSs in the activated UL (or joint) TCI states to support inter-cell or mTRP scenarios?~~

~~ii-1. What are the UE capabilities for measuring pathloss to support the active UL TCI list in inter-cell and mTRP?~~

RAN4 respectfully asks RAN1/2 to take RAN4 questions in consideration for UL TCI signaling and UE behaviors and define ‘active’ TCI state for ‘UL’.

**2. To RAN WG1 and WG2 group.**

**ACTION:** RAN1/2 kindly answers the questions from RAN4 in consideration for UE behaviors and capability for active TCI state for UL.

**3. Date of Next TSG-RAN WG4 Meetings:**

TSG-RAN4 Meeting #104-bis-e, Oct. 10, 2022.