**3GPP TSG RAN WG1 #107-e R1-2112829**

**e-Meeting, November 11th – 19th, 2021**

**Title:** LS on BFR for CORESET with two activated TCI states

**Response to:**

**Release:** Rel-17

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

**Source:** RAN1

**To:** RAN4

**CC:** RAN2

**Contact Person:**

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**1. Overall Description:**

In Rel-17, RAN1 has agreed two SFN transmission modes for PDCCH in which two TCI states can be activated for a CORESET. Two SFN modes support network based (TRP based pre-compensation scheme) and UE based (scheme 1) Doppler shift compensation for DL transmission.

For implicit BFD RS based on a CORESET with two activated TCI states, RAN1 has agreed that how to calculate radio link quality for RLM /BFD is up to RAN4 discussion.

Two options have been discussed in RAN1:

* Option 1: For a CORESET with two activated TCI states, two RS indexes are included in $\overbar{q}\_{0}$(as two BFD RS resources). Otherwise, UE follows the Rel-15/16 specification for BFD
* Option 2: For a CORESET with two activated TCI states, UE calculates single hypothetical BLER or single radio link quality for the CORESET

Some relevant agreements and conclusion from RAN1 are listed as follows

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| **Agreement**If enhanced SFN PDCCH transmission scheme (scheme 1 or TRP-based pre-compensation) is configured and two TCI states are activated for at least one CORESET, support the following configuration of RS for BFD* For implicit configuration
	+ Alt 1-2: RS of CORESETs with both single and two TCI states are used

FFS: The maximum number of BFD RS and details on RS determination  **Conclusion**No RAN1 specification impact on how to calculate hypothetical BLER for BFD   **Agreement** When CORESET is indicated with two TCI states* One BFD RS pair for SFN CORESET is counted as two BFD RSs
* FFS: Increase the maximum number of monitored BFD RSs to X.
	+ X is UE capability
	+ X = 2, 3, 4, FFS other values of X

 **Agreement** When two TCI states are activated for a CORESET, NBI RS can be configured as follows * Alt 4-1: Using the existing Rel-15 NBI configuration based on single SSB / CSI-RS resource
* FFS addition support of Alt 4-2: two new beam identification CSI-RS resource sets / new beam identification CSI-RS resource pairs or SSB pairs

 **Agreement**For a CORESET with two activated TCI states, for implicit BFD RS, how to calculate radio link quality for RLM /BFD is up to RAN4 discussion * Send LS to let RAN4 to let them know about two possible options of radio link quality estimation for RLM /BFD using each RS or RS pair of CORESET activated with two TCI states. RAN1 has discussed both options, but was not able to reach a consensus. Inform that it is up to RAN4 to specify the most appropriate option. LS is endorsed in R1-211XXXX (Chuangxin , ZTE ).
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**2. Actions:**

**To RAN4**

**ACTION:**

RAN1 would like to respectfully request RAN4 to take the above information into account.

**3. Date of Next TSG-RAN WG1 Meetings:**

TSG-RAN WG1 Meeting #107b-e 17th Jan. – 25th Jan. 2022 emeeting

TSG-RAN WG1 Meeting #108-e 21st Feb. – 3rd Mar. 2022 emeeting