**3GPP TSG RAN WG2 Meeting #109-e TD R2-200xxxx**

**Electronic meeting, 24th February – 6th March, 2020.**

Title: [DRAFT] Reply LS on CSI-RS capabilities (FG 2-33/36/40/41/43)

Response to: LS (R2-1916482) on Discussion over UE capabilities of FG2-36/2-40/2-41/2-43 from RAN1

Release: Release 16

Work Item: TEI16, NR\_newRAT-Core

Source: NTT DOCOMO, INC. (to be RAN2)

To: RAN1

Cc:

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Attachments:

**1. Overall Description:**

RAN2 would like to thank RAN1 for their LS on CSI-RS capabilities (FG 2-33/36/40/41/43). From the background mentioned in the LS, RAN2 understand the following two problems:

 **Problem 1**: Limitation of active CSI-RS ports/resources in a slot;

The triplet included in *SupportedCSI-RS-Resource* is defined pre frequency band outside the band combination signalling. As such, the supported value may not be scaled up in case of inter-band CA.

 **Problem 2:** Lack of overall capabilities per codebook type.

For FG-2-33, the maximum number of simultaneous CSI-RS resources and total number of CSI-RS ports in active BWPs across all CCs are common to all codebook types and so the UE may have to report the conservative values supported for all codebook types.

Given that the signalling details are left to RAN2 decision, RAN2 is working on the following solution direction to address the problems as well as balancing the signalling overhead.

For Problem 1:

* A UE can report additional SupportedCSI-RS-Resource (“triplet”) to indicate the higher value than the legacy (for the TDM case, as mentioned in the RAN1 LS).
* Additional *SupportedCSI-RS-Resource* (FFS: single or multiple) is reported for each codebook type per band (outside the band combination signalling).

For Problem 2:

* As for the total capability in active BWP across all CCs, the UE can report another value of:
	1. Maximum number of simultaneous CSI-RS resources;
	2. Total number of CSI-RS ports in simultaneous CSI-RS resources.
* The UE can report a pair of 1) and 2) for each codebook type per UE.
* Per supported band combination, the UE can indicate supported the set of resources (Details FFS).

To make progress the solution details for further, RAN2 observed the following questions.

Q1: Definition of CSI-RS ports/resources configured for the TDM case.

RAN2 understand that the legacy triplet included in SupportedCSI-RS-Resource is relevant to the following definition in sub-clause 5.2.1.6 of TS 38.214.

*In any slot, the UE is not expected to have more active CSI-RS ports or active CSI-RS resources than reported as capability.*

RAN2 is wondering if the current running CR to 38.306 describes “active Tx ports/resources across multiple slots” by referring to sub-clause 5.2.1.6 of TS 38.214is in line with RAN1’s understanding.

Q2: The maximum value of simultaneous CSI-RS resources and CSI-RS ports.

In the existing SupportedCSI-RS-Resource, the maximum value of simultaneous resources is 64 and the one of total Tx ports is 256. RAN2 is wondering if the existing value is enough to address the total capability across all CCs or the larger value is desirable.

Q3: indication of maxNumberTxPortsPerResource in a per BC manner

In the RAN1 LS it is stated that “To address above issue, RAN1 has agreed to recommend to introduce new per band capability signaling and per BC capability signaling for component 1 of FG2-36/2-40/2-41/2-43”. As the component 1 of FG2-36/2-40/2-41/2-43 contains maxNumberTxPortsPerResource, is RAN1’s intention to have this parameter explicitly to be reported in a per band and per BC manner? In addition if the triplet is deemed essential to be reported in a per BC manner, is it the intention that multiple sets of the triplet need to be reported?

**2. Actions:**

**To RAN1.**

**ACTION:** RAN2 respectfully asks RAN1 to answer to the above questions. It is noted that RAN2 agreed to extend the signalling as TEI16. RAN2 would appreciate if RAN2 could receive the feedback until the completion of Rel-16.

**3. Date of Next RAN2 Meetings:**

RAN2 Meeting #109bis 20th – 24th April 2020 Sapporo, Japan.

RAN2 Meeting #110 25th – 29th May 2020 Athens, Greece.