**3GPP TSG RAN WG1 #101-e R1-20xxxxx**

e-Meeting, May 25th – June 5th, 2020

Source: NTT DOCOMO, INC.

Title: Summary on [101-e-NR-TEIs-03]

Agenda Item: 7.2.12

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

# **Introduction**

This contribution summarizes the NR Rel-16 TEI related and CLI/RIM related discussions and proposals in AI 7.2.12.

[101-e-NR-TEIs-03] Email discussion/approval on remaining issue for aperiodic CSI-RS triggering with beam switching timing of 224 and 336

* + Whether/how to capture the new capability signaling for aperiodic CSI-RS triggering with beam switching timing of 224 and 336 in TS38.214
		- TP in [R1-2003763](../../../../../wanshic/OneDrive%20-%20Qualcomm/Documents/Standards/3GPP%20Standards/Meeting%20Documents/TSGR1_101/Docs/R1-2003763.zip) as starting point for the discussion

By 5/28 – Hiroki (DCM)

# **Remaining issue for aperiodic CSI-RS triggering with beam switching timing of 224 and 336**

In [5], the following remaining issue regarding aperiodic CSI-RS triggering with beam switching timing of 224 and 336 is identified.

* Since UE is not aware which functionality is supported by the gNB, new Rel-16 UE capability signaling for indicating beam switching timing of 224 and 336 should be introduced while Rel-15 capability and UE behavior should be unchanged. If the UE indicates *beamSwitchTiming* value other than 48, there would be an ambiguity on the actually assumed threshold for aperiodic CSI-RS.

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| Based on the agreement TP was agreed to TS 38.214 [2] and LS was sent to RAN2 [3]. The text in CR and LS to RAN2, however, assumes the Rel-15 UE capability will be used to indicate the values of 224 and 336. It should be noted that in the UE is not aware which functionality is supported by the gNB. Due to such uncertainty UE is unlikely to report 224 or 336 values using Rel-15 capability to ensure backward compatibility for the “old” gNB potentially not supporting UE behaviour for beam switching timing of 224 and 336. Then, the agreed enhancement for aperiodic CSI-RS based on Rel-15 capability indication becomes useless. **Observation**: * *Rel-15 capability signalling is not suitable for indication of the beam switching timing of 224 and 336.*

In order to solve the problem, it is necessarily to introduce Rel-16 capability for (e.g., beamSwitchTiming-r16) indicating new values of {224, 336} while keep supporting Rel-15 capability for the backward compatibility purpose without any changes. New UE behaviour in TS 38.214 defining threshold of 48 symbols for aperiodic CSI-RS can be enabled depending whether UE includes Rel-16 capability or not. It should be also noted that Rel-16 enhancement with beam switching timing of {224, 336} is supported based on UE capability and without explicit RRC configuration from gNB. Such approach was not recommended by RAN2 in the LS [4]. As the result ambiguity may occur on the actually assumed threshold for aperiodic CSI-RS, if UE in Rel-15 indicates *beamSwitchTiming* value other than 48 and also include new *beamSwitchTiming*-*r16* in Rel-16 implying threshold of 48 according to TS 38.214. To avoid ambiguity on the actually assumed threshold for aperiodic CSI-RS without explicit RRC signalling, UE including Rel-16 capability of {224, 336} should be required to include the value of 48 using Rel-15 *beamSwitchTiming*. The TPs capturing the above proposals to TS 38.214 and TS 38.306 are provided below:

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| 5.2.1.5.1 Aperiodic CSI Reporting/Aperiodic CSI-RS when the triggering PDCCH and the CSI-RS have the same numerology…If the scheduling offset between the last symbol of the PDCCH carrying the triggering DCI and the first symbol of the aperiodic CSI-RS resources in a *NZP-CSI-RS-ResourceSet* configured without higher layer parameter *trs-Info* is smaller than the UE reported threshold *beamSwitchTiming,* as defined in [13, TS 38.306], when the reported value is one of the values of {14, 28, 48}, or is smaller than 48 when the reported value of *beamSwitchTiming-r16* is one of the values of {224, 336}.- if there is any other DL signal with an indicated TCI state in the same symbols as the CSI-RS, the UE applies the QCL assumption of the other DL signal also when receiving the aperiodic CSI-RS. The other DL signal refers to PDSCH scheduled with offset larger than or equal to the threshold *timeDurationForQCL,* as defined in [13, TS 38.306], aperiodic CSI-RS scheduled with offset larger than or equal to the UE reported threshold *beamSwitchTiming* when the reported value is one of the values {14,28,48}, aperiodic CSI-RS scheduled with offset larger than or equal to 48 when the reported value of *beamSwitchTiming-r16* is one of the values {224, 336}, periodic CSI-RS, semi-persistent CSI-RS;- else, when receiving the aperiodic CSI-RS, the UE applies the QCL assumption used for the CORESET associated with a monitored search space with the lowest *controlResourceSetId* in the latest slot in which one or more CORESETs within the active BWP of the serving cell are monitored.- If the scheduling offset between the last symbol of the PDCCH carrying the triggering DCI and the first symbol of the aperiodic CSI-RS resources is equal to or greater than the UE reported threshold *beamSwitchTiming* when the reported value is one of the values of {14,28,48}, or is equal to or greater than 48 when the reported value of *beamSwitchTiming-r16* is one of the values of {224, 336}, the UE is expected to apply the QCL assumptions in the indicated TCI states for the aperiodic CSI-RS resources in the CSI triggering state indicated by the CSI trigger field in DCI. |

| ***beamSwitchTiming-16***beamSwitchTiming-16 of value (sym224 or sym336) indicates the minimum number of required OFDM symbols between the DCI triggering aperiodic CSI-RS and the corresponding aperiodic CSI-RS transmission in a CSI-RS resource set configured with repetition ‘ON’. UE indicating *beamSwitchTiming-16* and *beamSwitchTiming* for the same band shall set *beamSwitchTiming* to 48*.* | Band | No | No | FR2 only |
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Based on above, following remaining issue for aperiodic CSI-RS triggering with beam switching timing of 224 and 336 should be discussed in RAN1#101-e meeting. It should be noted that the introduction of the new capability signaling is also discussed in AI 7.2.11.12.

* **Whether/how to capture the new capability signaling for aperiodic CSI-RS triggering with beam switching timing of 224 and 336 in TS38.214**
	+ **TP in R1-2003763 as starting point for the discussion**

FL proposal is to agree on the introduction of the new capability signaling for aperiodic CSI-RS triggering with beam switching timing of 224 and 336, and to adopt the TP in R1-2003763.

**FL proposal 1:**

* **Introduce the new capability signaling for aperiodic CSI-RS triggering with beam switching timing of 224 and 336 (FG14-7 in UE features list)**
	+ **Adopt the TP in R1-2003763**

Companies are encouraged to check above FL proposals and to provide feedback if any in below. If you cannot accept the FL proposals, please put your company name after “Cannot accept the proposals” below and please provide your alternative proposal (in your comment) which could be acceptable to all in your consideration.

 Cannot accept the proposals:

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# **Conclusion**

**FL proposal 1:**

* **Introduce the new capability signaling for aperiodic CSI-RS triggering with beam switching timing of 224 and 336 (FG14-7 in UE features list)**
	+ **Adopt the TP in R1-2003763**

# **References**

[1] R1-2003423 Remaining issues on Half-Duplex Operation in CA vivo

[2] R1-2003492 Remaining issues on CLI ZTE

[3] R1-2003610 Remaining issues of half-duplex operation in CA CATT

[4] R1-2003692 On TRS muting for NR coexistence with a narrow band system MediaTek Inc.

[5] R1-2003763 Maintenance of aperiodic CSI-RS triggering with beam switching timing of 224 and 336 Intel Corporation

[6] R1-2003923 On ambiguous TBS due to ambiguity of Ninfo NEC

[7] R1-2004259 On remaining issues of HD UE feature Nokia, Nokia Shanghai Bell

[8] R1-2004604 Discussion on the conditions of rate matching pattern overlapping with PDSCH DMRS symbols Huawei, HiSilicon

[9] R1-2004642 Remaining issue for Rel-16 maintenance Ericsson