3GPP TSG RAN WG1 #118 R1-24xxxxx

**Maastricht, Netherlands, 19 – 23 August 2024**

Agenda item: 7

Source: Moderator (Nokia)

Title: Moderator summary on QCL assumption for periodic CSI-RS in unified TCI framework

Document for: Discussion and Decision

# Introduction

This moderator summary aims to gather companies’ views on the observations and proposals made in R1-2407093 [1] and draft CR R1-2407094 [2] on QCL assumptions for periodic CSI-RS in Rel-17 unified TCI framework submitted to RAN1#118.

# Discussion

**To facilitate offline discussion please provide your contact info in the table below:**

|  |  |
| --- | --- |
| Company | Name and email |
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## Round 1

The following observations are made in [1] on RAN1#108e agreement and corresponding change in 5.1.5 of TS 38.214:

**Observation 1**: UE behavior is not defined when TCI state is not configured for P-CSI-RS in Rel-17 unified TCI

**Observation 2**: QCL info for periodic CSI-RS needs to be updated via RRC signaling causing additional signaling overhead and delay during beam switch in unified TCI framework

### **Q1: Do you agree with the observations above? Please share your view on the significance of addressing the issue described in observation 2.**

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| Company | Comments |
| MediaTek | For observation 1, we agree with that on UE behavior is not defined for the case, which is the same as in Rel-15/16 TCI. There could be some use cases not configuring TCI state for P-CSI-RS, e.g., CSI-RS for BM.  For observation 2, we agree with it, however, it is the same as in Rel-15/16 TCI. |
| Google | In our view, we should firstly clarify whether such configuration (not configuring TCI state for P-CSI-RS) is allowed or not. There was an old discussion in R15, but no consensus was reached. |
| OPPO | We agree that the UE behavior is not defined, but we don’t think there is any issue. For P-CSI-RS as source RS, it is not needed to be defined. |
| Samsung | QCL info for periodic CSI-RS is updated through RRC/MAC-CE signaling, but signaling overhead and delay are the same as in previous releases. We don't think there are significant issues for periodic CSI-RS as a source. |
| ZTE | Issues related to the observations have been discussed before. However, we did NOT see any problem with current spec. |
| Nokia | Thanks for comments.  @MediaTek we agree that the UE behavior is also undefined in Rel-15/16; however, unlike legacy, R17 specification adds a negative assumption on applying indicated TCI state for periodic CSI-RS.  @Google such configuration does not violate R15/16 RAN1 specification.  @OPPO @ ZTE in our view mandatory RRC reconfiguration is non-desirable for every beam change, especially in FR2 deployments  @Samsung periodic P-CSI-RS QCL info can be updated only via RRC(*qcl-InfoPeriodicCSI-RS*) |
| CATT | This issue has been discussed during Rel-17 UTCI discussion and it was decided that periodic CSI-RS does not follow the indicated TCI state. There are pros/cons to let periodic CSI-RS to follow the indicated TCI state. It is not an maintenance issue. |
| Docomo | We agree the observations. However, we don’t think it is an issue.  Also, whether to apply indicated TCI to P-CSI-RS and whether to define QCL assumption for P-CSI-RS when TCI state is not configured were discussed in Rel.17. We are repeating the same discussion. |

It is proposed to replace mandatory RRC reconfiguration of periodic CSI-RS TCI state with an implicit QCL linkage to PDCCH, TRS and PDSCH. In other words, UE can apply Rel-17 indicated TCI state when it is not configured with any TCI state for periodic CSI-RS. This approach is similar to that of aperiodic CSI-RS, where UE uses QCL information included in the "indicated" DL only/Joint TCI state if *qcl-info* or *qcl-info2* are absent in *CSI-AperiodicTriggerStateList.* It is also observed in field that such approach is used for R15/16 TCI state of periodic CSI-RS and could be inherited in further releases. Based on that, the following proposal is submitted in [1] and [2].

**Proposal 1**: Adopt the following TP in 5.1.5 and 5.2.2 of TS 38.214 from Rel-17:

5.1.5 Antenna ports quasi co-location

< Unchanged text is omitted >

For semi-persistent CSI-RS, if the UE is configured with *dl-OrJointTCI-StateList*, the UE can assume that the indicated *TCI-State* is not applied.

For periodic CSI-RS, if the UE is configured with *dl-OrJointTCI-StateList* and *qcl-InfoPeriodicCSI-RS* is not configured, the UE can assume that the indicated *TCI-State* is applied.

< Unchanged text is omitted >

5.2.2.3.1 NZP CSI-RS

- *qcl-InfoPeriodicCSI-RS* contains a reference to a *TCI-State* indicating QCL source RS(s) and QCL type(s). If the *TCI-State* is configured with a reference to an RS configured with *qcl-Type* set to 'typeD' association, that RS may be an SS/PBCH block located in the same or different CC/DL BWP or a CSI-RS resource configured as periodic located in the same or different CC/DL BWP. The reference RS may additionally be an SS/PBCH block associated with a PCI different from the PCI of the serving cell. When this field is absent for target periodic CSI-RS, the UE can use QCL information included in the indicated *TCI-state*.

< Unchanged text is omitted >

### **Q2: Please share your views on the proposal 1 and its implications.**

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| Company | Comments |
| MediaTek | We have concern on such dynamic QCL update will cause impact to UE implementation on P-CSI-RS reception. However, we could compromise if it is limited only to P-CSI-RS for CSI acquisition, i.e., TRS and BM should be precluded. Note that TRS and BM should be the source RS of the indicated TCI state, there is no reason to apply the indicated TCI state to them. |
| Google | For unified TCI, it has been agreed that for channels that does not follow indicated TCI, R16 behaviour is reused. It seems this change is not aligned with previous agreement. |
| OPPO | We don’t support this. Similar view as MTK. |
| Samsung | It’s difficult to support. If we follow the proposal, it seems revert to previous agreement. |
| ZTE | Issues related to the observations have been discussed before. However, we did NOT see any problem with current spec. |
| Nokia | @Mediatek we are ok to limit change to certain CSI types, e.g. CSI for acquisition and BM  @Google R16 behavior is undefined for such case but does not preclude the proposed behavior  @Samsung it does not necessarily revert the agreement, as such behavior was left FFS: UE behaviour if TCI state is not indicated for P/SP-CSI-RS |
| CATT | It is a kind of new feature and can be discussed in TEI 19 for example. |
| Docomo | We have concern. It reverts the previous agreements. P-CSI-RS is monitored by multiple UEs in practical, it is impossible to update QCL assumption by DCI/MAC CE for one UE. |

As alternative to the above, the proponent considers adopting the change in later release or introducing dynamic signalling for updating TCI state of P-CSI-RS.

### **Q3: Please comment your preferences on the specification release from which to adopt the TP in Proposal 1?**

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| Company | Comments |
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### **Q4: Please share your views on mechanisms to update P-CSI-RS TCI state other than RRC signalling?**

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### **Q5: Please share any other concerns or considerations below**

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# References

1. [R1-2407093](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_118/Docs/R1-2407093.zip) Discussion on QCL assumption for periodic CSI-RS in unified TCI framework
2. [R1-2407094](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_118/Docs/R1-2407094.zip) Draft CR on QCL assumption for periodic CSI-RS in unified TCI framework