**3GPP TSG-RAN WG1 Meeting #109-e R1-220xxxx**

**e-Meeting, May 9th – 20th, 2022**

**Agenda Item: 7.2.8**

**Source: Moderator (Huawei)**

**Title: Summary #1 of [109-e-R16-Pos-01] on PRS reception without TDD configuration**

**Document for: Discussion and decision**

# Introduction

In RAN1#109-e, the following paper provided input on PRS reception without TDD configuration.

1. R1-2204922 PRS reception without TDD configuration Huawei, HiSilicon

It was observed in [1] that the existing specification text for handling PRS reception in dynamic/semi-static slot format configurations was intended for reception in the serving cell, for which the UE is aware of the slot format. However, there are cases were there can be PRS configured in a frequency layers entirely outside of the serving cell. [1] proposes to resolve the issue by specifying signalling of the TDD configuration for each TRP to the LMF.

The following observation are drawn:

***Observation 1: The existing PRS reception versus the slot format is intended for the case when serving cell is concerned, in which case the semi-static slot format and/or the dynamic SFI can be available at the UE.***

***Observation 2: It is possible that some positioning frequency layers does not contain any PRS from the serving cell.***

***Observation 3: The serving cell slot format may not be applied to the positioning frequency layers that do not contain the PRS from the serving cell.***

The following proposals are given:

***Proposal 1: RAN1 to clarify that for Rel-16, on positioning frequency layers that do not contain the PRS from any serving cell, UE may assume the symbol as DL/FL that is configured for PRS reception.***

***Proposal 2: RAN1 to discuss whether the following change is adopted in Rel-17:***

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| Introduce the TDD configuration in the assistance data   * The TDD configuration is provided per TRP or per positioning frequency layer, which is common for all TRPs within a positioning frequency layer. * For the TDD configuration of the non-serving cell, UE may receive the PRS on DL/FL symbols. * UE capability for TDD configuration is introduced for backward compatibility. * Introduce the NRPPa signaling for LMF to obtain the TDD configuration from each TRP. |

This paper provides the moderator summary of PRS reception without TDD configuration, subject to the following email discussion.

[109-e-R16-Pos-01] Email discussion/approval on PRS reception without TDD configuration, for Rel-16 for proposal 1 in R1-2204922, and for Rel-17 for proposal 2 in R1-2204922, by May 13 – Su (Huawei)

# PRS measurement without TDD configuration

## Rel-16 behaviour

### Round 1

The proposal from [1] is directly copied for comments.

### Proposal 2.1.1-1

* RAN1 to clarify that for Rel-16, on positioning frequency layers that do not contain the PRS from any serving cell, UE may assume the symbol as DL/FL that is configured for PRS reception.

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| **Company** | **Yes/No** | **Comments** |
| Qualcomm | No | Thanks for the discussion. The agreements that were posted in [1] are all before we agreed that in NR Rel-16, only MG-based PRS processing is supported. Specifically, the agreements are up to RAN1 #100, and then in 101 we agreed that the UE will not process DL PRS unless there is MG.  Agreement:   * UE is not expected to process DL PRS without configuration of measurement gap in Rel-16 * RAN1 assumes that no RAN4 requirements are to be defined for the case w/o configured measurement gap in Release 16 * Inform RAN4 about this agreement   In other words, all these agreements, and text in 38.213, the DL/UL/FL determinations with or without SFI, don’t have any impact on what the UE is expected to process in NR Rel-16. Based on RAN4, during a MG (this is just an example from 38.133):  -     is not required to conduct reception/transmission from/to the corresponding NR serving cells for SA (with single carrier or CA configured) except the reception of signals used for RRM measurement(s), PRS measurement(s) and the signals used for random access procedure according to [7].  Therefore, we believe no further clarification is really needed in this topic. The UE will gets the assistance data from the LMF, and will get an MG configuration (a per-UE configuration actually in NR Rel-16). It measures the PRS within the configured MG, independent of whether/what the TDDslotconfig says, or whether an SFI was received or not, or whether the UE was scheduled SRS, PUSCH, etc. |
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### Round 2

TBD

## Rel-17 behaviour

### Round 1

The proposal from [2] is directly copied for comments.

### Proposal 2.2.1-1

* **RAN1 to discuss whether the following change is adopted in Rel-17:**

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| Introduce the TDD configuration in the assistance data   * The TDD configuration is provided per TRP or per positioning frequency layer, which is common for all TRPs within a positioning frequency layer. * For the TDD configuration of the non-serving cell, UE may receive the PRS on DL/FL symbols. * UE capability for TDD configuration is introduced for backward compatibility. * Introduce the NRPPa signaling for LMF to obtain the TDD configuration from each TRP. |

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| **Company** | **Yes/No** | **Comments**  Including views on the TDD configuration provision per TRP or per positioning frequency layer |
| Qualcomm | No | Assuming we are discussing about the MG-less PRS processing feature, we tend to believe that the intention of this proposal is to do an optimization which could potentially be avoided with network planning and correct network configuration.  Specifically, going back to LTE, the TDD config was added due to the following reason:   * The LTE PRS was defined with FDD in mind, where there is a start subframe and a length (occasion) of “N\_PRS consecutive DL subframes.” This same interpretation was then also used for TDD, and results in the problem that the “total length” of a PRS occasion depends on the TDD format. * Below is a configuration used in the OTDOA test cases for TDD:   + uplink-downlink configuration = 3 , IPRS = 9 (= “PRS subframe offset”), NPRS = 6 (= number of PRS subframes).   + The positioning occasion consists of 6 consecutive downlink subframes, but there are uplink and special subframes in between. That is, the total PRS “window” is 10 subframes long, and the UE need to know where the DL subframes are in this window (which requires knowledge of the TDD configuration (if not the same as the serving cell)).   So it was really a problem of “definition of an LTE PRS configuration Parameter”. Such problem does not exist in NR, so we don’t see the clear need of this proposal.  We believe the intention of this proposal is the following:   * A UE gets, within an active BWP from the serving cell (cell1) of a Band1, PRS configs from multiple cells in Band1, and for one of these cells (lets call it cell2), specific set of symbols are UL, whereas for cell1 these same symbols are DL. The intention of the proposal seems to be that, it would be nice if the network could signal to the UE that it should not process the PRS from cell2, but it should still process the PRS from cell1. If that is really the intention, it looks like an optimization and not a correction for Rel-17.   Across multiple PFLs: With regards to MG-less PRS processing, when it comes to the argument that the TDDConfig of the serving cell in PFL1, may mandate the slotconfig of the other cells in PFL2, since for MG-less PRS processing, the UE needs to have an active BWP on the PFL2, we don’t see the problem: It will be the slotconfig of the serving cell at PFL2 that matters, and not the TDDconfig of the serving cell in PFL1. |
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### Round 2

TBD

## Other comments

### Round 1

Please provide other comments, if any, beyond the proposals in section 2.1 and section 2.2.

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| **Company** | **Comments** |
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# Conclusion