**3GPP TSG RAN WG1 #106e R1-210xxxx**

**e-Meeting, August 16th – 27th, 2021**

**Source: Moderator (ZTE Corporation)**

**Title: Email discussion [106-e-NR-Pos-03] on expected RSTD and RSTD uncertainty per TRP pair**

**Agenda item: 7.2.8**

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

# Introduction

In this contribution, we provide summary of email discussion [105-e-NR-Pos-03] per Chairman’s guidance as following,

[106-e-NR-Pos-03] Email discussion/approval on expected RSTD and RSTD uncertainty per TRP pair (Aspect #3) until August 20 – Guozeng (ZTE)

# Remaining Opens

In this section, we summarize one TP / draft CR [1] that was agreed to further discuss on how to capture it in specification according feature lead summary for AI 7.2.8 in preparation phase.

## Aspect #3: Expected RSTD and RSTD Uncertainty

In [1], it is stated that according to the field descriptions in TS 37.355, *nr-DL-PRS-ExpectedRSTD* indicates the RSTD value that the target device is expected to measure between one TRP and the assistance data reference TRP. Therefore, the proposed correction aims to clarify that *nr-DL-PRS-ExpectedRSTD* and *nr-ExpectedRSTD-Uncertainty* are defined per pair of TRPs rather than per pair of DL PRS resource sets.

During the preparation phase, it was also argued by proponent that the current texts in specification may be interpreted that the *nr-DL-PRS-ExpectedRSTD* is provided for a pair of DL PRS resource sets from the same TRP (e.g. in case that one TRP is associated with multiple ARPs). To avoid confusion, the specification should explicitly say that *nr-DL-PRS-ExpectedRSTD* and *nr-DL-PRS-ExpectedRSTD-Uncertainty* are provided per pair of TRPs.

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| ---- Unchanged texts omitted ----5.1.6.5 PRS reception procedure<Unchanged parts are omitted>For the case when measurement gap is configured, the UE DL PRS processing capability is defined in [TS 37.355]. For the purpose of DL PRS processing capability, the duration *K* msec of DL PRS symbols within *P* msec window corresponding to the maximum PRS periodicity in a positioning frequency layer, is calculated by*-* Type 1 duration calculation with UE symbol level buffering capability*-* Type 2 duration calculation with UE slot level buffering capability*- S* is the set of slots based on the numerology of the DL PRS of a serving cell within the *P* msec window in the positioning frequency layer that contains potential DL PRS resources considering the actual *nr-DL-PRS-ExpectedRSTD*, *nr-DL-PRS-ExpectedRSTD-Uncertainty* provided for each pair of the associated *dl-PRS-ID* of the DL PRS and the reference provided by *nr-DL-PRS-ReferenceInfo*.*-* For Type 1, is the smallest interval in msec within slot corresponding to an integer number of OFDM symbols based on the numerology of the DL PRS of a serving cell that covers the union of the potential PRS symbols and determines the PRS symbol occupancy within slot , where the interval considers the actual *nr-DL-PRS-ExpectedRSTD*, *nr-DL-PRS-ExpectedRSTD-Uncertainty* provided for each pair of the associated *dl-PRS-ID* of the DL PRS and the reference provided by *nr-DL-PRS-ReferenceInfo*. *-* For Type 2, is the numerology of the DL PRS, and is the cardinality of the set .---- Unchanged texts omitted ---- |

## First round of comments

Companies are encouraged to provide their view on the TP in the table below

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| Company | Comment |
| OPPO | Do not think the proposed change is needed. The expectedRSTD is provided per TRP and the expectedRSTD is applied to all the PRS reosurce set and also resources of that TRP. The 38.214 specification sentence invlvoled in this TP actually does not specify how the expected RSTD is configured, instead it only states that the expectedRSTD applied to one PRS resource set is considered in the interval calculation. Therefore, that sentence in 38.214 does not cause misunderstanding on the configuration of expectedRSTD and no change is needed.  |
| Huawei, HiSilicon | We also do not think the change is needed. We agree with OPPO that Expected RSTD and Expected RSTD uncertainty is applicable to all resource sets in the respective TRP pair for a given positioning frequency layer (pair), but it does not harm to allow spec to use DL PRS resource set in the context.I quote the discussion in the email thread provided by ZTE that

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| According to the field descriptions in TS 37.355, nr-DL-PRS-ExpectedRSTD indicates the RSTD value that the target device is expected to measure between one TRP and assistance data reference TRP. Therefore, the parameters nr-DL-PRS-ExpectedRSTD and nr-DL-PRS-ExpectedRSTD-Uncertainty are provided per pair of TRPs rather than per pair of DL PRS resource sets highlighted in the following,Figure OmittedFor example, the highlighted parts may be interpreted the nr-DL-PRS-ExpectedRSTD is provided for a pair of DL PRS resource sets from the same TRP (e.g. in case that one TRP is associated with multiple ARPs). To avoid confusion, the spec should explicitly say that nr-DL-PRS-ExpectedRSTD and nr-DL-PRS-ExpectedRSTD-Uncertainty are provided per pair of TRPs. |

The potential confusion raised by ZTE may not be the case, in that it is possible to configure intra-TRP expected RSTD/uncertainty for the resources are on different positioning frequency layers.For example, TS 37.355 readsNR-DL-PRS-AssistanceDataPerTRP-r16 ::= SEQUENCE { dl-PRS-ID-r16 INTEGER (0..255), nr-PhysCellID-r16 NR-PhysCellID-r16 OPTIONAL, -- Need ON nr-CellGlobalID-r16 NCGI-r15 OPTIONAL, -- Need ON nr-ARFCN-r16 ARFCN-ValueNR-r15 OPTIONAL, -- Need ON nr-DL-PRS-SFN0-Offset-r16 NR-DL-PRS-SFN0-Offset-r16, nr-DL-PRS-ExpectedRSTD-r16 INTEGER (-3841..3841), nr-DL-PRS-ExpectedRSTD-Uncertainty-r16  INTEGER (0..246), nr-DL-PRS-Info-r16 NR-DL-PRS-Info-r16, ...}The IE *NR-DL-PRS-AssistanceDataPerTRP* defines the AD for a TRP on a positioning frequency layer. In RAN1, we also concluded that *dl-PRS-ID* can be reused to denote a TRP deployed across multiple positioning frequency layers, while the DL-PRS resource set ID is counted within a TRP across all positioning frequency layers.Therefore, for the case of the single TRP supporting in multiple positioning frequency layers (with the same dl-PRS-ID, different PCI/ARFCN, same or different ARP/TEG), the expected RSTD could take the same value or different value subject to network deployment, and that can even be applicable to the reference TRP! |
| vivo | We share the understanding of OPPO and Huawei. We don’t see the need for such changes. |
| Nokia/NSB | We agree with the above comments that this change is not needed.  |
| QC | Similar view with the comments above; we don’t think that there is any ambiguity.  |
| Intel | As it was commented during preparation phase, in our view RAN1/RAN2 specs are aligned. We do not see strong motivation for change. |
| ZTE | To Huawei,Firstly, the current spec “each pair of DL PRS resource sets” may also be interpreted as “ a pair of DL PRS resource sets from the same positioning frequency layer and the same TRP” since up to 2 DL PRS resource sets can be configured per positioning frequency layer and per TRP. This may still lead to confusion.Secondly, we agree that intra-TRP expected RSTD/uncertainty can be configured in current spec. However, we have doubt on the necessity of such configuration. Since different positioning frequency layers associated with the same TRP are transmitted from the same geometrical coordinate, why different positioning frequency layers should be configured with different expected RSTD/uncertainty? |
| Huawei, HiSilicon | To ZTE, we have a lot of parameters that controls the lower level IEs, yet is provided in higher level, since such an ASN.1 structure ensures that the parameters are applicable to all lists of lower level IEs.Do you think the following change is needed? Does the current wording gives the ambiguity that *dl-PRS-ResourceBandwidth*, *dl-PRS-StartPRB* could be different for different TRPs on a positioning frequency layer or that *dl-PRS-NumSymbols* could be different for different resources in a resource set?*- dl-PRS-ResourceBandwidth* defines the number of resource blocks for the associated positioning frequency layer configured for DL PRS transmission. The parameter has a granularity of 4 PRBs with a minimum of 24 PRBs and a maximum of 272 PRBs. All DL PRS resources sets within a positioning frequency layer have the same value of *dl-PRS-ResourceBandwidth*.*- dl-PRS-StartPRB* defines the starting PRB index for the associated positioning frequency layer of the DL PRS with respect to reference Point A, where reference Point A is given by the higher-layer parameter *dl-PRS-PointA*. The starting PRB index has a granularity of one PRB with a minimum value of 0 and a maximum value of 2176 PRBs. All DL PRS resource sets belonging to the same positioning frequency layer have the same value of *dl-PRS-StartPRB*.*- dl-PRS-NumSymbols* defines the number of symbols for the associated DL PRS resource set of the DL PRS within a slot where the allowable values are given in Clause 7.4.1.7.3 of [4, TS38.211]. |
| CATT | We think the issue is worth discussing and looking for a solution. We prefer to firstly verify the motivation of the change. If current descriptions in 37.355 had mentioned not only the case of inter-TRP expected RSTD/uncertainty, but also the case of intra-TRP expected RSTD/uncertainty, the original motivation does not seem to exist. Therefore, maybe new motivation is needed for the change, or updated CR is needed for current situation. |
| Ericsson | We agree with several companies above, this is not needed/not essential.  |
| ZTE | Given that most companies think this is not a essential issue, we’re fine to leave RAN1 spec unchanged.However, we want to check with group on the following issue.The expected RSTD/uncertainty in TS 37.355 is mandatorily configured, which means DL PRS resource sets from different positioning frequency layers may be associated with different expected RSTD/uncertainty( i.e. intra-TRP expected RSTD/uncertainty as mentioned by Huawei). We have doubt on the necessity of such configuration. Since different positioning frequency layers associated with the same TRP are normally transmitted from the same geometrical coordinate, why different positioning frequency layers should be configured with different expected RSTD/uncertainty? Therefore, to save signaling overhead, we think the expected RSTD/uncertainty can be optionally configured. If it’s not configured, which means it’s the same with the expected RSTD/uncertainty value configured for other DL PRS resource sets associated with the same TRP.Do other companies think it’s necessary to send LS to RAN2 on the above issue identified by RAN1.NR-DL-PRS-AssistanceDataPerTRP-r16 ::= SEQUENCE { dl-PRS-ID-r16 INTEGER (0..255), nr-PhysCellID-r16 NR-PhysCellID-r16 OPTIONAL, -- Need ON nr-CellGlobalID-r16 NCGI-r15 OPTIONAL, -- Need ON nr-ARFCN-r16 ARFCN-ValueNR-r15 OPTIONAL, -- Need ON nr-DL-PRS-SFN0-Offset-r16 NR-DL-PRS-SFN0-Offset-r16, nr-DL-PRS-ExpectedRSTD-r16 INTEGER (-3841..3841), nr-DL-PRS-ExpectedRSTD-Uncertainty-r16  INTEGER (0..246), nr-DL-PRS-Info-r16 NR-DL-PRS-Info-r16, ...} |

# Conclusions

After the comments from involved companies, it was agreed to support:

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# References

1. R1-2106540 Interpretation of expected RSTD and expected RSTD uncertainty ZTE