**3GPP TSG-RAN WG1 Meeting #106-e R1-21xxxxx**

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

**Agenda Item: 7.2.8**

**Source: Moderator (vivo)**

**Title: Summary of [106-e-NR-Pos-05]**

**Document for: Discussion and decision**

# Introduction

This document provides the summary for [106-e-NR-Pos-05] on alignment with RAN4 on DL PRS Processing.

[106-e-NR-Pos-05] Email discussion/approval on alignment with RAN on DL PRS processing (Aspect #6) until August 20 – Huaming (vivo)

# General information

In [1], it is noticed that based on current TS 38.133, in RSTD/RSRP/Rx-Tx time difference measurement period requirements, it is described that if more than one PRS periodicities are configured in PRS frequency layer *i*, the least common multiple of PRS periodicities among all DL PRS resource sets is used to represent the periodicity of DL PRS resource on frequency layer *i* and further derive the measurement period of that PRS frequency layer *i*.

It is proposed to adopt one of the following options and related text proposals into TS38.214 regarding PRS processing capability.

***Option 1:*** ***change the descriptions related to ‘P msec window’ to align with RAN4 specification***.

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| --- |
| < 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~~ described in Clause 9.9.2.5 [11, TS 38.133], is calculated by…  < Unchanged parts are omitted > |

***Option 2:*** ***delete the descriptions related to ‘P msec window’.***

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| --- |
| < 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…  < Unchanged parts are omitted > |

In [2], the following changes were proposed to align with RAN4 specification on DL PRS processing:

* Evaluation window of P should no longer be corresponding to the maximum PRS periodicity, and the simplest way is to cite the RAN4 terminology .
* Duration calculation equation, the counted PRS slot/symbol should be mapping to those PRS that are neither muted nor outside the MG. From RAN1 perspective, those PRS could be referred to as “PRS to process”, as UE is not expected to process those PRS outside the MG or muted.
* Change the wording “For the purpose of DL PRS processing capability” since it may sometimes be interpreted inaccurately. The suggested wording can be “For the purpose of DL PRS processing”.

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| --- |
| =========================== Unchanged parts ===========================  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, the duration *K* msec of DL PRS symbols within *P* msec window corresponding to as defined in clause 9.9 of [11, TS 38.133] in 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 to process considering the actual *nr-DL-PRS-ExpectedRSTD*, *nr-DL-PRS-ExpectedRSTD-Uncertainty* provided for each pair of DL PRS Resource Sets.  *-* 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 to process 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 DL PRS resource sets (target and reference).  *-* For Type 2, is the numerology of the DL PRS, and is the cardinality of the set .  =========================== Unchanged parts =========================== |

# Discussion

## *P msec window*

As pointed out by [1] and [2], current description window P is not aligned with RAN4’s specification and not technical correct. Both [1] and [2] proposed to align window P to RAN4 specification. Given the proposed option 1 in [1] and the proposed TP in [2] are very similar with the same intention: to cite the RAN4 specification and given TP in [2] is more clear on the clause of TS38.133, moderator suggest to take that change.

### Round #1

**Proposal 1: Select the following text proposal to align with RAN4 on DL PRS processing with respect to P msec window.**

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| --- |
| < 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 as defined in clause 9.9 of [11, TS 38.133] ~~the maximum PRS periodicity~~ in ~~a~~ positioning frequency layer *i*, is calculated by…  < Unchanged parts are omitted > |

Companies are invited to express their views and suggestions in table below:

|  |  |
| --- | --- |
| Company Name | Comments |
| OPPO | OK with the proposal |
| Huawei, HiSilicon | Support. |
| vivo | OK |
| Intel | Support |
| Qualcomm | We are worried about circular references (38.133 also points to 38.214). We prefer Option 2 shown above, where we don’t say anything about “P msec” being the T\_PRS or the periodicity of PRS, etc.  To be more specific, the 38.214 spec just says how the “duration K msec” will be counted (either Type 1 or 2), with any generic window P. The 38.133 says how the reported capability, together with the AD, will be used to derive the measurement period.  *the duration K msec of DL PRS symbols is […] calculated by […]*   * *S is the set of slots based on the numerology of the DL PRS of a serving cell within the P msec window*   So, pick any window P, doesn’t matter what it is. In order to calculate what is K, you do the procedure described in this section of the spec. Then, in 38.133, now that a reader knows how K is determined, it plugs it in the **following**:  is the time duration of available PRS to be measured in the positioning frequency layer i, **and is calculated in the same way as PRS duration K defined in clause 5.1.6.5 of TS 38.214 [26].**  We also want to keep the word “capability”. This is what this text is about; how to interpret the PRS processing capability. How this capability is being used for the measurement period formulation is written in 38.133.  So, overall we prefer Option 2. |
| ZTE | Prefer Option 2 to avoid circular references. |
| CATT | We are fine with the proposal, since it makes the description of window P being aligned with RAN4’s specification. |
| Ericsson | OK |
| Qualcomm2 | We want to continue that the proposal is not correct and will make things worse. Please also note the agreed RAN4 document (R4-2105851) slide 5 that shows as green:    In other words, the L\_PRS (aka PRS duration K) is calculated by aggregating the duration of the PRS resources that fall **within MG and are not muted.** In other words, it is NOT T\_PRS\_i.  In either way, no matter what is the observation window to derive L\_PRS in 38.133, 38.214 is written ***generically.*** It just says, for any Period P msec, how can one determine what is K? That is what 38.214 says.  So we can only accept Option 2, and we want companies to re-evaluate their views, and if they have concerns on the RAN4 agreements to discuss it with the colleagues in that working group. |
| Apple | Option 2. We have same reading as QC. |

**Moderator’s summary:**

All companies agree on the need to fix the description of window P with respect to the maximum periodicity. Two companies can only accept Option 2 in [1] as the fix. Their reason for not citing RAN4’s terminology TPRS,I is that TPRS,I still is not correct for K calculation. Another company prefer Option 2 in [1] as well to avoid circular references between RAN1 and RAN4 specification.

It is moderator’s understanding that Option 2 in [1] can address the issue without referring to RAN4’s specification. With that, formulate proposal 1a by taking option 2 in [1] for round #2 discussion.

### Round #2

**Proposal 1a: Select the following text proposal (option 2 in [1]) to align with RAN4 on DL PRS processing with respect to P msec window.**

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| --- |
| < 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…  < Unchanged parts are omitted > |

Companies are invited to express their views and suggestions in table below:

|  |  |
| --- | --- |
| Company Name | Comments |
| Huawei, HiSilicon2 | To QC: Regarding following comments:  *In other words, the L\_PRS (aka PRS duration K) is calculated by aggregating the duration of the PRS resources that fall* ***within MG and are not muted.*** *In other words, it is NOT T\_PRS\_i.*  My understanding is that the above only talks about how K is counted, instead how **evaluation period** is determined. How K is counted is the whole motivation of the changes in 3.2 (adding “to process”).  In this section, we only consider aligning the evaluation period, and using *T\_PRS,i* should be no problem. Please correct me if there is any problem  One question to QC: If RAN1 provide generic duration calculation, how would it be able to consider MG covering and muting? Don’t you think adding some restriction that UE only needs count the K based on PRS that it is processing (including MG covering, muting, and even UE PRS resource capability) would be helpful?  We are OK with the option 2 also, but we do not think there is any circular referencing issue. |
| ZTE | Support |
| CATT | Support |
| QC | To HW: but we don’t think the evaluation period is T\_PRS\_i . The agreement says it is the duration of the PRS that are within MG and are not muted:    That’s not T\_PRS\_i. T\_PRS\_i is the periodicity of PRS with muting, but doesn’t say about MGs:  *is the periodicity of DL PRS resource with muting on positioning frequency layer i.*  The appropriate would be the T\_available:  *,* the least common multiple between and .  And this the reason, that this is the one that is being used to scaled the UE capability\_T\_i, and lead to the final effective measurement periodicity:  *is the periodicity of the PRS RSTD measurement in positioning frequency layer i defined as:*  *=*  But either way, as explained above, we don’t see a need in 38214 to talk about this, because as you also point out, 38.214 just says how “K” is computed for any type of window P. |
| vivo | Support |

**Moderator’s summary:**

It seems proposal 1a is acceptable. So moderator suggest to agree it.

## *Other changes*

[2] also proposed some other changes for clarity and to avoid confusion.

- Duration calculation equation, the counted PRS slot/symbol should be mapping to those PRS that are neither muted nor outside the MG. From RAN1 perspective, those PRS could be referred to as “PRS to process”, as UE is not expected to process those PRS outside the MG or muted.

- Change the wording “For the purpose of DL PRS processing capability” since it may sometimes be interpreted inaccurately.

### Round #1

**Proposal 2: Decide whether to adopt the following changes.**

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| --- |
| =========================== Unchanged parts ===========================  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~~,  …  *- 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 to process considering the actual *nr-DL-PRS-ExpectedRSTD*, *nr-DL-PRS-ExpectedRSTD-Uncertainty* provided for each pair of DL PRS Resource Sets.  *-* 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 to process 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 DL PRS resource sets (target and reference).  =========================== Unchanged parts =========================== |

Companies are invited to express their views and suggestions in table below:

|  |  |
| --- | --- |
| Company Name | Comments |
| OPPO | Ok with the proposal |
| Huawei, HiSilicon | Support. |
| vivo | We don’t see the need for both changes. Current wording is clear and no confusion.  As we recalled, the whole paragraph in TS 38.214 is for the purpose of UE DL PRS processing capability assumption alignment between UE and the network. It’s actually not about UE reception/processing procedure. We don’t support to remove “capability” and to add “to process”. |
| Intel | We prefer to keep current wording. Otherwise, more explanation can be added directly to spec on muting and MG, on top of the wording “to process” that seems to be rather open to interpretations. |
| Qualcomm | Not needed |
| ZTE | Not needed. We already agree that UE capability is designed for inside measurement gaps. |
| CATT | We are fine with the deletion of “capability”. And we prefer not to add the “to process”, since maybe we need more explanation on the “to process”, e.g, those PRS that are neither muted nor outside the MG. In addition, the wording of “potential” is used before the DL PRS resources and PRS symbols, which will play the similar role of “to process”. |
| Ericsson | Since the purpose of this paragraph is to detail the impact of processing capability, we prefer the current wording. |
| Apple | Current wording is more accurate; no change needed |

**Moderator’s summary:**

Majority of companies don’t see the need for the proposed wording changes and prefer to keep current wording. Given no consensus to take the proposed changes, moderator suggest to close this discussion point in section 3.2.

# Summary

Moderator recommendation to agree:

**Proposal 1a: adopt the following text proposal (option 2 in [1]) to align with RAN4 on DL PRS processing with respect to P msec window.**

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| --- |
| < 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…  < Unchanged parts are omitted > |

# References

1. R1-2107991 Maintenance on Rel-16 NR positioning vivo
2. R1-2108189 Aligning PRS duration calculation with RAN4 Huawei, HiSilicon