**3GPP TSG-RAN WG4 Meeting #98-bis-eR4-2106997**

**Electronic Meeting, 12 – 20 April, 2021**

**Agenda item:** 5.5.1

**Source:** Moderator (Huawei)

**Title:** Email discussion summary for [98-bis-e][206] NR\_pos\_1

**Document for:** Information

# Introduction

The scope of this email discussion includes the following agenda items:

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| 5.5.1 RRM core requirements maintenance (38.133) [NR\_pos-Core]  5.5.1.1 PRS-RSTD measurement requirements [NR\_pos-Core]  5.5.1.2 PRS-RSRP measurement requirements [NR\_pos-Core]  5.5.1.3 UE Rx-Tx time difference measurement requirements [NR\_pos-Core]  5.5.1.4 Other requirements |

In providing comments, companies are encouraged to:

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# Topic #1: RSTD measurement period

## Companies’ contributions summary

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| **T-doc** | **Company** | **Proposals / Observations** |
| [**R4-2104427**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2104427.zip) | ZTE Corporation | Draft CR |
| [**R4-2104741**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2104741.zip) | CATT | **Proposal 1: Do not define requirements for the case of PRS resource muting in Rel-16.**  **Proposal 2: Only the PRS resources or resource sets configured which are fully or partly within the MGs should be considered.**  **Proposal 3: LPRS,i should be the PRS time duration during the effective PRS periodicity (i.e.).**  **Proposal 4: The requirement of non-overlapping case should be the same as for overlapping case (sum approach). I.e. there is no need to differentiate the overlapping and non-overlapping case.**  **Proposal 5: RSTD measurement period is not impacted by PRS-RSRP measurement.**  **Proposal 6: The UE behavior and RSTD measurement requirements when HO occurs during the measurement are already clearly specified in 38.133 clause 9.9.2.5. No further clarification is needed.** |
| [**R4-2104743**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2104743.zip) | CATT | Draft CR |
| [**R4-2106334**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106334.zip) | Qualcomm Incorporated | **Proposal 1: If muting option 1 is applied, the periodicity of a PRS resource is scaled by where is X \* *dl-prs-MutingBitRepetitionFactor*, and X is the size of NR-*MutingPattern-r16* for *mutingOption1-r16.***  **Proposal 2: Exclude at least PRS resource sets for which none of the resources fall (at least partly) within MGs for the purpose of calculating .**  **Proposal 3: FFS for the purpose of calculating , whether to count only PRS resource sets for which at least some of the PRS resources fall completely (including at least the minimum number of repetitions specified in the accuracy requirements) within MGs.**  **Proposal 4: The steps listed below provide a generic framework to calculate .**   1. **The PRS periodicity indicated by “NR-DL-PRS-Periodicity-and-ResourceSetSlotOffset-r16”** 2. **Scale the PRS periodicity based on inter-period muting pattern** 3. **Derive the frequency layer specific periodicity () if multiple periodicities are configured in this layer** 4. **Derive the available periodicity within MGs ()** 5. **Derive the effective periodicity based on PRS processing time ()**   **Proposal 5: for PFL *i* should be calculated by aggregating the duration of all the PRS resources that fall within MGs over a time period equal to , i.e. the least common multiple of and .**  **Proposal 6: Redefine as  *= +*  (currently  *= +* )**  **Proposal 7: Retain the current way the measurement period is captured in the specification (option 1A) and possibly add a note to clarify that no per-PFL requirements are expected to be enforced in scenarios with multiple PFLs.**  **Proposal 8: Requirement of non-overlapping case should be the same as for overlapping case, i.e. sum approach.**  **Proposal 9: Measurement periods for different positioning methods are independent.**  **Proposal 10: The RSTD measurement period is independent of whether or not PRS-RSRP is reported for DL-TDOA.**  **Proposal 11: Add the following text to TS 38.133 sections 9.9.2.5, 9.9.3.5 and 9.9.4.5: “If during the measurement period of one or more positioning frequency layers, the MG pattern is reconfigured (at most once for each positioning frequency layer) to enable UE to measure DL PRS resources, the measurement period can be longer.”**  **Proposal 12: FFS whether to specify precisely how much to extend the measurement period when MGs are reconfigured during the measurement period.**  **Proposal 13: FFS applicability of measurement requirements if the network reconfigures MGs during the measurement period without the UE requesting it.**  **Proposal 14: The RSTD measurement requirements when HO occurs during the measurement are already clearly specified in 38.133 clause 9.9.2.5.** |
| [**R4-2106452**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106452.zip) | Intel Corporation | ***Proposal 1: Do not define requirements for the case of PRS resource muting in Rel-16.***  ***Proposal 2: The measurement time for the last PRS sampling defined in RSTD measurement period requirements [2] can be = + when considering the different PRS resource offset.***  ***Proposal 3: Requirement of non-overlapping case should be the same as for overlapping case.***  ***Proposal 4: RSTD measurement period shall not be impacted by PRS-RSRP measurement.***  ***Proposal 5: More clarifications on applicability conditions of RSTD measurement requirements can be implemented in the maintenance stage of Rel16.***  ***Proposal 6: The unified term of “Positioning frequency layer” shall be used in RAN4 specification.*** |
| [**R4-2106515**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106515.zip) | OPPO | **Proposal 1: Avoid PRS configurations with different resource offsets on the same PFL.**  **Proposal 2: Support option 1A to capture the period equations in the specifications.**  **Proposal 3: RSTD measurement period is not impacted by PRS-RSRP for all the scenarios.** |
| [**R4-2106624**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106624.zip) | vivo | **Proposal 1: If muting option 1 is applied, the periodicity of a PRS resource is scaled by , where is X \* dl-prs-MutingBitRepetitionFactor, and X is the size of NR-MutingPattern-r16 for mutingOption1-r16**  **Proposal 2: Lprs is defined as the time duration in ms of the number of PRS symbols available with measurement gap(s) during time period T ms.**  **Proposal 3: No need to specify steps on deriving periodicities in the measurement period requirements.**  **Proposal 4: Option 1A is used to define measurement period requirements for RSTD measurement under overlapping case.**  **Proposal 5: The requirements for measurement period of multiple PRS layers under fully non-overlapping case are specified the same as for overlapping case, i.e., sum-based.**  **Proposal 6: RSTD measurement period shall not be impacted by PRS-RSRP measurement in scenario 1, 2, 3 and 4.** |
| [**R4-2106628**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106628.zip) | vivo | Draft CR |
| [**R4-2106997**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106997.zip) | Huawei, HiSilicon | **Proposal 1: If muting option 1 is applied, the periodicity of a PRS resource is scaled by = X \* *dl-prs-MutingBitRepetitionFactor*, and X is the size of NR-*MutingPattern-r16* for *mutingOption1-r16.***  **Proposal 2: TPRS,i is defined as**  **where is the configured periodicity of PRS resource j on the PFL i, and is the scaling factor if muting option 1 is applied on PRS resource j (defined in Proposal 1), provided that PRS resource j is fully or partly within the MG.**  **Proposal 3: RSTD measurement period of a single PRS frequency layer is extended by T ms if different PRS resources on the PRS frequency layer have different offsets with or without muting.**  **Proposal 4: Lprs is counted over the time period of TPRS,i, and it only includes the duration of PRS resources that are not muted and fall within MG.**  **Proposal 5: Keep the variable TRSTD,i the spec, and clarify that it is the measurement period of PFL i when no other PFL is measured.**  **Proposal 6: RAN4 not to define separate requirements for the case when measurement gaps and processing time T do not have overlap between different positioning frequency layers in Rel-16.**  **Proposal 7a: RSTD measurement period is not impacted by the PRS-RSRP measurement configured for DL-TDOA.**  **Proposal 7b: RSTD measurement period is not impacted by the PRS-RSRP measurement configured for another positioning method, if they are measured on the same set of PRS resources.**  **Proposal 7c: PRS measurement requirements do not apply when UE is configured PRS measurement for more than one positioning methods with different sets of PRS resources to measure.** |
| [**R4-2106998**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106998.zip) | Huawei, HiSilicon | Draft CR |
| [**R4-2107159**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2107159.zip) | Ericsson | * ***Observation 1****: When UE is configured with RSTD and PRS-RSRP, both measurements shall meet the accuracy.* * ***Proposal 1****: UE behavior when RSTD is configured together with PRS-RSRP and the required PRS-RSRP measurement period is longer than that for RSTD (configured without RSTD): the RSTD measurement continues over the entire PRS-RSRP measurement period.* * ***Observation 2****: PRS are cell-specific, and not all PRS resources may be used by the UE, e.g., only PRS resources within the (useful part of) MG can be used for measurements.* * ***Proposal 2****: Clarify in RSTD measurement period requirements that the measured PRS resources shall be contained in at least some MGs.* * ***Observation 3****: PRS are always performed in gaps, so MGRP imposes the restriction on which PRS are used by a given UE. However, PRS are cell-specific, so no need to restrict PRS periodicity.* * ***Proposal 3****: No need to restrict PRS periodicity to be a multiple of 5 ms.* * ***Observation 4****: The non-overlapping case is the only case in LTE. The overlapping case does not even exist in LTE.* * ***Proposal 4****: RAN4 agrees that the current measurement period in TS 38.133 is over-defined for the non-overlapping case – it is unnecessarily scaled to account for the overlap which does not exist and thus too long.* * ***Observation 5****: Positioning time is crucial for emergency and also for UE power in emergency, so RAN4 shall not unnecessarily over-define the measurement period.* * ***Proposal 5****: Measurement period for the non-overlapping case shall be:*   TRSTD, Total = maxi (TRSTD,i), where  *the measurement period starts with the first MG and it is the same for all frequencies (agreement from RAN4#96-e). Hence, the time to the last sample across all frequencies will correctly determine TRSTD, Total, regardless of the order the frequencies are measured.*   * ***Proposal 6***: *Option 1B from the GTW session:*   + Option 1B   TRSTD, Total = Note: needs to be removed from the specification |
| [**R4-2107160**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2107160.zip) | Ericsson | Draft CR |
| [**R4-2107181**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2107181.zip) | Nokia, Nokia Shanghai Bell | **Proposal 1** : Consider option 1b for PRS muting pattern : the periodicity of a PRS resource is scaled by where is X \* *dl-prs-MutingBitRepetitionFactor*, and X is the [maximum] number of consecutive zeros in *NR-MutingPattern-r16* for *mutingOption1-r16.*  **Observation 1 :** Partial PRS resource in MG will be a corner, and it wouldn’t be easy to consider in the measurement period calculation.  **Proposal 2 :** If dl-PRS-Periodicity-and-ResourceSetSlotOffset-r16 offset of a single PFL is configured differently, then the requirement is extended by  *= +*  . Otherwise, no change is needed due to *dl-PRS-ResourceSlotOffset-r16offsets*.  **Observation 2 :** There are notation confusions with *Lprs* in TS38.133. The notation of *Lprs* does not appear  *in* 5.1.6.5 of TS 38.214, somehow TS38.133 refers to 5.1.6.5 of TS 38.214 regarding *Lprs.*  **Proposal 3:** TS 38.133 should use the definition of *Lprs* from 5.1.6.5 of TS 38.214, i.e. the total number of symbols of PRS resources in ms that a UE needs to measure in *P* ms. But the notation needs be changed to avoid confusion (for example :  **Proposal 4:** Add additional explanation on how to obtain to TS38.133 equation statements. For example,   * is the total number of DL PRS symbols [ms] that UE needs to measure in *P* ms can be counted from *K* msec of DL-PRS symbols derived from 5.1.6.5 of TS 38.214.   **Observation 3 :** In calculation, it is unclear in the spec that the observation window sizes *T* ms of the UE processing capability and *P* ms for total number of processing are equally set for calculation.  **Propose 5.** In order to use the value of , the observation window sizes *T* ms of the UE processing capability and *P* ms for total number of processing symbols should be equal.   * Both the observation window sizes *T ms and P ms* must be defined from the maximum PRS periodicity from the network configurations.   **Proposal 6 :** Clarify a rule to calculate UE’s processing capability *{N,T}* from UE venders*.*  **Proposal 7 :** For capturing the equations in the specifications, we prefer Option 1A   * + - Option 1A:   **Proposal 8 :** Requirement of non-overlapping case should be the same as for overlapping case.  **Observation 4 :** PRS-RSRP is a key measurement used for analysis of beam correspondence and measurement accuracy in all kinds of positioning measurements. RSRP measurement behavior of a UE does not change due to other method configurations.  **Proposal 9 :** We support option-2 regarding PRS-RSRP configured for DL-TDOA or other scenarios  UE behavior when RSTD is configured together with PRS-RSRP and the required PRS-RSRP measurement period is longer than that for RSTD (configured without RSTD) : the RSTD measurement continues over the entire PRS-RSRP measurement period. |

## Open issues summary

### Sub-topic 1-1: Determination of parameter in measurement period

#### Issue 1-1-1: PRS resource muting

*The issue is about whether and how to account PRS resource muting in measurement period requirements*

* Proposals
  + Option 1 (CATT, Intel)
    - Do not define requirements for the case of PRS resource muting in Rel-16.
  + Option 2a (QC, vivo, HW, OPPO)
    - If muting option 1 is applied, the periodicity of a PRS resource is scaled by N\_muting where N\_muting is X \* *dl-prs-MutingBitRepetitionFactor*, and X is the size of NR-*MutingPattern-r16* for *mutingOption1-r16*.
  + Option 2b (Nokia)
    - If muting option 1 is applied, the periodicity of a PRS resource is scaled by N\_muting where N\_muting is X \* *dl-prs-MutingBitRepetitionFactor*, and X is the [maximum] number of consecutive zeros of NR-*MutingPattern-r16* for *mutingOption1-r16*.
* Recommended WF
  + Further discuss

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| **Company** | **Comments** |
| CATT | Support option 1. Both option 2a and 2b can only applied in certain cases and over-extend the measurement delay. And we have already considered so many parameters as scaling factor which has caused long measurement period, so option 1 is suggested. |
| vivo | Option 2a.  For option 1, we would like to understand a bit more. Does it mean that configuration of PRS muting is not allowed for Rel-16 UEs or it is up to UE implementation how muting will be handled when mutingoption1 is configured. |
| OPPO | Support option 2a. When PRS resource muting is applied by network, the actual number of PRS samples during measurement period without extension as proposed in option 2a will be reduced and consequently the accuracy cannot be guaranteed. Compared with option 2b, option 2a is simple and reasonable. Although option 2a may over-extend the measurement delay, RAN4 requirements should consider the worst case, e.g. *dl-prs-MutingBitRepetitionFactor* =1 and muting pattern = 0100, and UE is allowed to achieve shorter delay in other scenarios, e.g. *dl-prs-MutingBitRepetitionFactor* =1 and muting pattern = 0111. |
| Nokia | We consider Option 2b is proper, otherwise option 1 is also fine. We prefer that actual muting part must be considered if a muting pattern is considered in the requirement rather than the size of NR-MutingPattern-r16. In this sense, we thought 2b is closer to such intention.  As another case, the 37.355 says  “When the UE receives a TREP-bit muting pattern together with a PRS periodicity TPRS for the same cell which exceeds 10240 subframes (i.e., TREP × TPRS > 10240 subframes), the UE shall assume an n-bit muting pattern based on the first n-bits, where n = 10240/TPRS.”  If  TREP × TPRS > SFN cycle, then not all of muting pattern bits are taken into account of actual muting. In this case, the muting PRS won’t be the full size of NR-MutingPattern-r16.  Therefore, if a muting pattern is considered in the requirement, we propose that actual muting PRS are considered as [delete “consecutive” from the option 2b]   * If muting option 1 is applied, the periodicity of a PRS resource is scaled by N\_muting where N\_muting is X \* *dl-prs-MutingBitRepetitionFactor*, and X is the [maximum] number of ~~consecutive~~ zeros of NR-*MutingPattern-r16* for *mutingOption1-r16*. * Count effective mute pattern for SFN wrapping cycle.   Alternatively, we are fine with option-1 “do not define requirements for the case of PRS resource muting in Rel-16”, because it would look complex to consider muting patterns here and muting patterns would considerably increase the measurement period. |
| Intel | It shall be noted that this issue can impact the other perf part works. So regarding to the timeline, we prefer no any specific requirements for the muting scenario. And theoretically the performance of RSTD measurement in case of muting case is better than that of non-muting case. In current requirements, the other scaling factors (e.g. 4 samples) may be enough. |
| Huawei | Support option 2a.  Option 1 limits the applicable scenario of the requirements. Option 2b will increase UE complexity in scheduling the PRS measurement with irregular muting patterns. |
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#### Issue 1-1-2: Overlapping with MG

*It was agreed in RAN4#98-e that TPRS,i would be derived based on LCM of periodicities of PRS resource on PLF i, and this issue is about whether only PRS resources that are partially or fully overlapped with MG are considered.*

*It is noted that the meaning of “PRS resources fall completely within MG” will be addressed generically in Issue 2-2-2.*

* Proposals
  + Option 1a (CATT, HW)
    - Only the PRS resources or resource sets configured which are fully or partly within the MGs should be considered
  + Option 1b (QC)
    - Exclude at least PRS resource sets for which none of the resources fall (at least partly) within MGs for the purpose of calculating
  + Option 1c (Ericsson)
    - Clarify in RSTD measurement period requirements that the measured PRS resources shall be contained in at least some MGs
* Recommended WF
  + It seems all the options are similar. Discuss whether the following wording can be used as a starting point for agreement.
    - For the purpose of calculating , only the resource sets, which have at least one PRS resource fully or partially with the MG, are considered.

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| **Company** | **Comments** |
| CATT | The recommended WF can be a starting point for agreement. But should it be ‘For the purpose of calculating only the PRS resources fully or partially with the MG are considered.’in which PRS resource sets is removed? Because for calculation of TPRS,i, the PRS resources should be the minimum unit. If we said PRS resources set is considered, it means all the resources in this set should be considered including the resources that not overlapped with gap. |
| OPPO | The recommended WF is fine to us and we would like to have a clarification on the wording “fully or partially with the MG”. In our understanding, it means the time span of some/all PRS instance (with one or sufficient repetitions) should be covered by one MG occasion, e.g. PRS1 and PRS2 in the following figure. And the PRS resource without any PRS instance fully covered by one MG occasion, e.g. PRS3 and PRS4, should not be considered, which is also discussed in issue 2-2-2. |
| Nokia | We can support the recommended WF. |
| Intel | The recommended WF is fine for us. |
| Huawei | Support the Recommended WF.  To CATT, the suggested wording is technically same as the original one, so it is also fine for us. It is note that all resources in a resource set have same periodicity.  To OPPO, we can discuss the meaning of “PRS resources fall completely within MG” will be addressed generically in Issue 2-2-2. |
| Ericsson | We are fine with the WF |

#### Issue 1-1-3: Steps to derive measurement period

*In RAN4#98-e, some companies proposed the following steps to derive measurement period. The issue is about whether the steps can be agreed, and if so, whether and how they should be captured in the spec.*

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| * The applying order to scale the PRS periodicity should be   + A): The PRS periodicity indicated by “NR-DL-PRS-Periodicity-and-ResourceSetSlotOffset-r16”   + B): Scale the PRS periodicity based on inter-period muting pattern   + C): Derive the frequency layer specific periodicity () if multiple periodicities are configured in this layer   + D): Derive the available periodicity within MGs ()   + E): Derive the effective periodicity based on PRS processing time () |

* Proposals
  + Option 1 (QC, OPPO)
    - The steps provide a generic framework
  + Option 2 (vivo, HW)
    - No need to specify steps explicitly in the spec as long as requirements are clearly defined
* Recommended WF
  + Further discuss whether the steps can be agreed, and if so, where they should be captured, e.g. in the WF or in the spec.

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| **Company** | **Comments** |
| CATT | Support option 2. There is no need to define the steps since it can be indicated from the formula. |
| vivo | Option 2. No need to capture anything of the steps in the spec, which are already indicated implicitly in the measurement period requirements. |
| OPPO | Support option 1 and we are also fine to implicitly reflect the steps by definition of and . In fact, only step B is under discussion and could be modified once any conclusion for issue 1-1-1 is reached. The other steps have already been agreed and we assume they are acceptable for other companies. Then the main argument is whether/how to specify the such steps in the spec. we can compromise to option 2. With the common understanding of the steps, the discussion of other periodicity-related issues, e.g. long-periodicity criteria, can be more efficient. So, we suggest to reach a consensus at least in RAN4 WG. |
| Nokia | We tent to support option 2. It does not need to be specified in the spec.  Note that some of factor calculations such as muting pattern and have not yet been agreed. The step presentation should be just for information at the end of discussion. |
| Intel | Support Option 2. And in RAN4 spec, some assumption on UE measurement order is redundant. |
| Huawei | Option 2.  Technically we agree with the steps, but no need to specify them explicitly in the spec. |
| Ericsson | Support option 2 |

#### Issue 1-1-4: Restriction on PRS resource periodcity

*It was agreed in RAN4#98-e that TPRS,i would be derived based on LCM of periodicities of PRS resource on PLF i. The issue is whether to restrict PRS periodicity to be a multiple of 5 ms.*

*Based on moderator’s understanding, the intention of the RAN4#98-e agreement is to accommodate all PRS resource periodicities, and it implicitly means no need to restrict PRS periodicity to be a multiple of 5 ms requirement wise.*

* Proposals
  + Option 1 (Ericsson)
    - No need to restrict PRS periodicity to be a multiple of 5 ms
* Recommended WF
  + Further discuss if option 1 is agreeable

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| **Company** | **Comments** |
| CATT | Fine with option 1. |
| vivo | There is no restriction on PRS periodicity configuration based on agreements in the last meeting. No further agreement is needed. |
| OPPO | Support option 1. |
| Nokia | Agree. It would be convenient to use multiples of 5 ms for the requirement calculations, but no need to restrict it. |
| Intel | Option 1 is fine for us. |
| Huawei | Support option 1. |
| Ericsson | Support WF (option 1) |

### Sub-topic 1-2: Consideration on different resource offsets in measurement period

#### Issue 1-2-1: Consideration on different resource offsets in measurement period

*The issue is about whether and how to account for different offsets of PRS resources on a PLF in measurement period.*

* Proposals
  + Option 1a (QC, Intel)
    - Redefine as  *= +*  (currently  *= +* )
  + Option 1b (Nokia)
    - If *dl-PRS-Periodicity-and-ResourceSetSlotOffset-r16* offset of a single PFL is configured differently, then the requirement is extended by  *= +* .
    - Otherwise, no change is needed due to *dl-PRS-ResourceSlotOffset-r16offsets*.
  + Option 2 (OPPO)
    - Avoid PRS configurations with different resource offsets on the same PFL
  + Option 3 (HW)
    - RSTD measurement period of a single PRS frequency layer is extended by T ms
* Recommended WF
  + Further discuss

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| **Company** | **Comments** |
| vivo | Option 1a is reasonable to us. |
| OPPO | Does this issue discuss UE with type-2 PRS processing capability only? In our understanding, for the UE with type-1 PRS processing capability, longer RSTD measurement period is expected since the measurement time for each PRS samples should be extended, not only the last PRS samples. |
| Nokia | We can support 1a. |
| Intel | Support Option 1a. |
| Huawei | We can support option 1a based on the analysis in QC R4-2106334.  On option 2b, *dl-PRS-ResourceSlotOffset-r16* can be up to 512 slot, so it may not be a small offset in time that can be ignored. Option 2 is limiting the potential of PRS interference coordination by making resources from different TRPs orthogonal in time domain.  To OPPO, we do not see clear dependence on type-1 v.s. type-2 UE capability, so could you please elaborate a bit more? |
| Ericsson | Option 1a is fine for us |

### Sub-topic 1-3: Determination of parameter in measurement period

#### Issue 1-3-1: Observation window

*In RAN4#98-e, it was agree to* *refer to clause 5.1.6.5 of 38.214 for calculation of Lprs. The issue is about the observation window of Lprs, i.e. over which time period the PRS resource duration are counted.*

* Proposals
  + Option 1 (CATT, QC)
  + Option 2a (HW)
    - TPRS,i
  + Option 2b (Nokia)
    - TPRS,i
    - The observation window sizes for *Lprs* and for *UE processing capability ‘N’* are identical.
  + Option 3 (vivo)
    - Ti
* Recommended WF
  + Further discuss

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| **Company** | **Comments** |
| CATT | The Lprs should be observed in the available PRS period which is used for calculating measurement delay. |
| vivo | In the measurement period requirements,  The ratio Lprs/N indicates the ratio of the number of PRS symbols that UE needs to process over the number of PRS symbols that UE can process within certain period of time. In our view the Lprs should be defined as the duration of number of PRS symbols within T ms because the ratio of Lprs/N means if Lprs is larger than N then additional PRS occasion is needed for UE to process those PRS symbols beyond N. It doesn’t make sense if Lprs and N are defined with different time period. |
| OPPO | Support option 1 |
| Nokia | It is T\_PRS,i , maximum PRS periodicity per PFL from spec clause 5.1.6.5 of 38.214. Other factors like muting pattern is not considered here.  Also, when using , observation window sizes for Lprs and for UE processing capability ‘N’ need to be same. |
| Intel | We support Option 2a,2b as it shall be same as “N” |
| Huawei | Support option 2a, but we can compromise to option 1 since typically they are same.  On option 2b, if the intention of the second bullet is that Tprs is identical to T, then we cannot agree because the former is NW configuration while the latter is UE capability. It would be very difficult for NW to guarantee this condition is met as it means NW has to adapt PRS configuration based on individual UE’s capability.  On option 3, we can consider two cases  1) T<Tprs, in this case, counting PRS duration over T or Tprs would give the same Lprs.  2) T>Tprs, in this case, as UE has not completed the processing, it would not take new measurements, and counting PRS duration over T would make the requirements unnecessarily relaxed. |

#### Issue 1-3-2: MG and resource muting

*In RAN4#98-e, it was agree to* *refer to clause 5.1.6.5 of 38.214 for calculation of Lprs. The issue is about whether PRS resource that are not overlapped with MG and PRS resources that are muted should be counted in Lprs.*

* Proposals
  + Option 1 (QC)
    - for PFL *i* should be calculated by aggregating the duration of all the PRS resources that fall within MGs
  + Option 2 (HW)
    - Lprs only includes the duration of PRS resources that are not muted and fall within MG
* Recommended WF
  + It seems the two options are similar related to MG. Discuss whether the following can be agreed
    - for PFL *i* should be calculated by aggregating the duration of all the PRS resources that fall within MGs
  + Further discuss if PRS resources that are muted should be excluded from Lprs

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| **Company** | **Comments** |
| CATT | Fine with the recommended WF. |
| vivo | Agree with recommended WF. |
| OPPO | Support the recommended WF. |
| Nokia | We can support the recommended WF proposal. |
| Intel | Support the recommended WF. |
| Huawei | Support Recommended WF.  We also support that PRS resources that are muted should be excluded from Lprs. |
| Ericsson | WF is fine. |

#### Issue 1-3-3: Notation and clarification for Lprs

*The issue is whether to change the notation of Lprs to align with 38.214 and avoid possible confusion with Lprs defined in 38.211, and how to clarify the meaning of the parameter.*

*It is noted that Issue 1-3-3 is focused on how the definition of Lprs should be captured/clarified in the spec, while the observation window for Lprs is discussed in Issue 1-3-1.*

* Proposals
  + Option 1 (Nokia)
    - TS 38.133 should use the definition of *Lprs* from 5.1.6.5 of TS 38.214, i.e. the total number of symbols of PRS resources in ms that a UE needs to measure in *P* ms. But the notation needs be changed to avoid confusion (for example :
    - Add additional explanation on how to obtain to TS 38.133 equation statements. For example,
      * is the total number of DL PRS symbols [ms] that UE needs to measure in *P* ms can be counted from *K* msec of DL-PRS symbols derived from 5.1.6.5 of TS 38.214.
  + Option 2 (vivo)
    - Lprs is defined as the time duration in ms of the number of PRS symbols available within measurement gap(s) during time period T ms.
* Recommended WF
  + Further discuss

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| **Company** | **Comments** |
| CATT | Based on the discussion in issue 1-3-1 and issue 1-3-2. Lprs is the PRS resources duration time in available PRS period, in which only the resources that fall within gap are calculated. |
| vivo | The definition of Lprs needs to be clarified in TS 38.133. It can be based on conclusion of Issue 1-3-1 and Issue 1-3-2. Option 2 is reasonable based on comments for Issue 1-3-1  It is fine to revise the notation of Lprs. |
| Nokia | Actually, is already used in TS38.211 with different meaning. It is better to change the notation with further explanation in TS38.133 as well. Otherwise, it causes confusion. |
| Intel | Prefer Option 1 but can be FFS. |
| Huawei | Support to change the notation for Lprs to avoid confusion with 38.211.  On the wording, we suggest the following (combining the two options):  is the total duration of DL PRS symbols [ms] available within measurement gap(s) within time period of *[TBD]*, and is identical to *K* ms of DL-PRS symbols derived from 5.1.6.5 of TS 38.214. |
| Ericsson | Use same notation as in RAN1 specs (38.211, 38.214) to avoid confusion. |

#### Issue 1-3-4: Rule to calculate UE’s processing capability {N,T}

*The issue is based on Proposal 6 of Nokia R4-2107181, and is about how UE reports its processing capability {N,T}.*

*Based on moderator’s understanding, this may not be RAN4 scope as the capability is defined by RAN1.*

*Meanwhile, companies can provide their understanding about how the reported capability is calculated, e,g. is it based on physical PRS symbol or effective PRS symbols, and its dependence on BW and SCS, as raised up in R4-2107181.*

* Proposals
  + Option 1 (Nokia)
    - Clarify a rule to calculate UE’s processing capability {N,T} from UE venders
* Recommended WF
  + Further discuss if any clarification is needed, and if so, should it be done in RAN4.

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| **Company** | **Comments** |
| CATT | We would like more about the intention of this issue. |
| vivo | UE processing capability is defined in TS 38.214 and TS 37.355 clearly. No rule in RAN4 is necessary. |
| Nokia | First, the observation window is related to UE’s processing capability. We think that the two window sizes must be same. The way to determine *‘T’* must be clear corresponding to L\_PRS window.  Secondly, we think at least some range of value ‘N’ needs to be specified to avoid ill-use of the capability report and requirements. ( for example, the number of PRS symbols in *ms* during T\_PRS and minimum/maximum of its values )  In addition, RAN1 designed DL-PRS structure to avoid large buffering requirement using the staggering structure. We note that there will be certain ways to avoid the need for buffering of all physical PRS symbols. |
| Intel | Such capability is defined by RAN1. So RAN4 needs not such clarification. |
| Huawei | We understand Lprs and capability N are based on physical PRS symbols, and aligned with the left part of Figure 1 in Nokia R4-2107181. As defined in RAN1 feature list, the capability N is reported assuming maximum DL PRS bandwidth in MHz, so it is independent of BW or SCS.  Based on above, we do not see a need to make any clarification from RAN4 perspective. |
| Ericsson | We do not see the need to define or clarify in RAN4. If needed RAN2 can clarify in their spec. |

### Sub-topic 1-4: Measurement period of multiple PLFs

#### Issue 1-4-1: Requirements for overlapping case

*In RAN4#98-e, following two options were agreed regarding how to capture the measurement period for overlapping case. The issue is about which option to choose.*

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| --- |
| * Option 1A:   + Note: is already defined in the specification * Option 1B   + TRSTD, Total =   + Note: needs to be removed from the specification |

* Proposals
  + Option 1 (QC, OPPO, vivo, HW, Nokia)
    - Option 1A
      * QC: possibly add a note to clarify that no per-PFL requirements are expected to be enforced in scenarios with multiple PFLs
      * HW: clarify that it is the measurement period of PFL i when no other PFL is measured
  + Option 2 (Ericsson)
    - Option 1B
* Recommended WF
  + Further discuss if option 1A can be agreed based on majority view, and consider to add some clarification if needed.

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| **Company** | **Comments** |
| CATT | Support option 1A. |
| vivo | Support option 1 |
| OPPO | Support option 1A. |
| Nokia | Support Option 1A |
| Intel | Support Option 1A, |
| Huawei | Support option 1A.  We are fine to use the clarification proposed by QC, if a clarification is deemed needed. |
| Ericsson | We also fine with option 1A.  But for consistency better to use TRSTD,i (instead of TPRS-RSTD,i) in the second row. |

#### Issue 1-4-2: Requirements for non-overlapping case

*The issue is about measurement period requirements for non-overlapping case*

* Proposals
  + Option 1 (CATT, QC, Intel, vivo, HW, Nokia)
    - The requirement of non-overlapping case should be the same as for overlapping case (sum approach)
  + Option 2 (Ericsson)
    - RAN4 agrees that the current measurement period in TS 38.133 is over-defined for the non-overlapping case – it is unnecessarily scaled to account for the overlap which does not exist and thus too long.
    - Measurement period for the non-overlapping case shall be:

TRSTD, Total = maxi (TRSTD,i), where

the measurement period starts with the first MG and it is the same for all frequencies (agreement from RAN4#96-e). Hence, the time to the last sample across all frequencies will correctly determine TRSTD, Total, regardless of the order the frequencies are measured.

* Recommended WF
  + Further discuss

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| **Company** | **Comments** |
| CATT | Support option 1. |
| vivo | Support option 1 |
| OPPO | Generally, we can compromise to option 1. One issue for option 1 is when long-periodicity PRS PFL and short-periodicity PRS PFL are configured, they could be measured in different MG occasions in parallel, which is also related to issue 2-1-6. |
| Nokia | We support option 1. This depicts the minimum requirement for Rel-16. Non-overlapping scenario can be further considered in Rel-17 in the framework of reduced latency for measurement acquisition, as commented earlier. |
| Intel | Support Option 1. |
| Huawei | Support option 1. |
| Ericsson | While we think that Option 1 will lead to considerable relaxation compared to option 2.  But for the sake of progress we are fine with Option 1. |

### Sub-topic 1-5: Measurement period when configured with PRS-RSRP

#### Issue 1-5-1: PRS-RSRP configured for DL-TDOA

*The issue is about whether RSTD measurement period would be impacted by PRS-RSRP measurement configured for DL-TDOA.*

* Proposals
  + Option 1 (CATT, QC, Intel, OPPO, vivo, HW)
    - RSTD measurement period is not impacted by PRS-RSRP measurement.
  + Option 2 (Ericsson, Nokia)
    - UE behavior when RSTD is configured together with PRS-RSRP and the required PRS-RSRP measurement period is longer than that for RSTD (configured without RSTD): the RSTD measurement continues over the entire PRS-RSRP measurement period
* Recommended WF
  + Further discuss
  + It is noted that RSTD and PRS-RSRP are measured from the same sets of PRS resources, and the measurement period is same based on current requirements, so proponent of option 2 please clarify when the case in option 2 could happen.

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| **Company** | **Comments** |
| CATT | Support option 1. |
| vivo | Support option 1. |
| OPPO | Support option 1. |
| Nokia | We prefer option-2. With option-1, we may see cases that RSTD measurement is out-dated compared to PRS-RSRP measurement. |
| Intel | Support Option1. The fundamental problem is PRS RSRP for DL-TDoA need not be measured separately with RSTD. |
| Huawei | Support option 1.  We do not see when the case in option 2 would happen, and even it happen, we think RSTD measurement period should not be prolonged due to PRS-RSRP measurement. |
| Ericsson | We support option 2. But one compromise can be to state in the spec e.g.  when PRS-RSRP is configured for DL-TDOA then the measurement period of RSTD and PRS-RSRP shall be the same. |

#### Issue 1-5-2: PRS-RSRP configured for another positioning method

*The issue is about whether RSTD measurement period would be impacted by PRS-RSRP measurement configured for another positioning method.*

* Proposals
  + Option 1 (CATT, Intel, OPPO, vivo)
    - RSTD measurement period is not impacted by PRS-RSRP measurement.
  + Option 2 (HW)
    - RSTD measurement period is not impacted by the PRS-RSRP measurement configured for another positioning method, if they are measured on the same set of PRS resources.
    - PRS measurement requirements do not apply when UE is configured PRS measurement for more than one positioning methods with different sets of PRS resources to measure.
  + Option 3 (Ericsson, Nokia)
    - UE behavior when RSTD is configured together with PRS-RSRP and the required PRS-RSRP measurement period is longer than that for RSTD (configured without RSTD): the RSTD measurement continues over the entire PRS-RSRP measurement period
  + Option 4 (QC)
    - Measurement periods for different positioning methods are independent.
* Recommended WF
  + Further discuss
  + It is noted that PRS resources for RSTD and PRS-RSRP are independently configured (for different positioning methods), so they may be same or different.

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| **Company** | **Comments** |
| CATT | Fine with option 1 and option 2. If different resources are configured for RSTD and PRS-RSRP, they may need to compete for the same gap. |
| vivo | Support option 1 and agree with option 4. Option 4 would be the reason why RSTD measurement period is not impacted by PRS-RSRP measurement |
| OPPO | Support option 1. |
| Nokia | We support option-3 with the same reason as above. Also we can compromise to option-4. |
| Intel | In our understanding, in case of the PRS resource configuration for RSTD is different with RSRP, the requirements can be independent completely. Why shall we consider the impacts on RSTD requirements from RSRP with other PRS resource? In this issue , we are discussing the requirements for RSTD |
| Huawei | Support option 2.  For example, if RSTD is to be measured from PFL #1 while PRS-RSRP is to be measured from PFL #2, effectively UE needs to measure 2 PFLs instead of one. UE cannot meet the measurement period requirements for each of RSTD and PRS-RSRP when the other measurement is not configured. |
| Ericsson | We support option 3. But one compromise can be to state in the spec e.g.  when PRS-RSRP and RSTD are configured using separate OTDOA assistance data then the measurement periods of RSTD and PRS-RSRP may be different. |

### Sub-topic 1-6: Measurement period with HO

#### Issue 1-6-1: Clarification for measurement period with HO

*In RAN4#98-e, some companies proposed to add the following clarification to the measurement period with HO. The issue is about whether this clarification is needed.*

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| * Clarify in section 9.9.2.5 of TS 38.133 (clarification is in **bold**):   + If **intra-frequency or inter-frequency** handover occurs while RSTD measurements are being performed, then the UE shall continue and complete the on-going RSTD measurements. |

* Proposals
  + Option 1 (CATT, QC)
    - No further clarification is needed
* Recommended WF
  + It seems two companies consider current requirements as clear, and no company proposes further clarification. Further discuss whether option 1 can be agreed and the issue can be closed.

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| **Company** | **Comments** |
| CATT | Support option 1. |
| OPPO | Support option 1. |
| Nokia | Support option-1. |
| Intel | Option 1 |
| Huawei | Support option 1. |
| Ericsson | The reason of **intra-frequency or inter-frequency** HO is to exclude the case of inter-RAT HO. In NR, the UE does inter-RAT LTE RSTD measurement.  Without such clarification there may be some ambiguity. |

### Sub-topic 1-7: Measurement period with MG reconfiguration

#### Issue 1-7-1: MG reconfiguration per UE request

*The issue is about how to account for MG reconfiguration per UE request on measurement period.*

* Proposals
  + Option 1 (QC)
    - Add the following text to TS 38.133 sections 9.9.2.5, 9.9.3.5 and 9.9.4.5: “If during the measurement period of one or more positioning frequency layers, the MG pattern is reconfigured (at most once for each positioning frequency layer) to enable UE to measure DL PRS resources, the measurement period can be longer.”
    - FFS whether to specify precisely how much to extend the measurement period when MGs are reconfigured during the measurement period.
* Recommended WF
  + Further discuss

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| **Company** | **Comments** |
| CATT | Fine with option 1. |
| vivo | Option 1 is not clear. If MG is reconfigured, the measurements may also be reconfigured. Even if only MG is reconfigured, i.e., measurement objects remain the same, UE would restart the measurement after reconfiguration.  Moreover, if shorter MG periodicity is reconfigured, it would be possible that measurement period may be shorted based on also other configurations, such as PRS periodicities. |
| OPPO | In case MG is reconfigured during RSTD measurement period, the measurement will be impacted. Either prolonging measurement period in option 1 or restarting measurement period can be further discussed. |
| Nokia | If MG is reconfigured, the requirement evaluation may be supposed to be reset or the measurement period may be prolonged. The scenario as such in our view is similar exceptional case as issue 1.2.6.1. We also consider the positioning measurement in RRC\_CONNECTED to be rather infrequent, so MG reconfiguration can take place in between positioning requests. |
| Intel | The scenario when MGs are reconfigured during the measurement period is rarely happened because all PRS measurement is up to LMF configuration. It is strange that why LMF wan reconfig MG for PRS measurements. |
| Huawei | Support the first bullet of option 1, i.e. to capture the existing agreement to the spec.  We do not support to specify the exact extension considering that such reconfiguration issue is not specific to positioning measurement. |
| Ericsson | The reconfiguration of the MG gap can be initiated by the BS autonomously or in response to the UE request.  It is ok to clarify that …. the measurement period can be longer.  However, it is not realistic to quantify the extended period since it is up to the NW how much time it takes to send reconfiguration.  In summary we are ok with first bullet but not with second bullet. |

#### Issue 1-7-2: MG reconfiguration not per UE request

*The issue is about whether RSTD measurement period would be impacted by PRS-RSRP measurement configured for another positioning method.*

* Proposals
  + Option 1 (QC)
    - FFS applicability of measurement requirements if the network reconfigures MGs during the measurement period without the UE requesting it.
* Recommended WF
  + Further discuss

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| **Company** | **Comments** |
| CATT | If the MG reconfiguration makes the PRS resources outside of the gap, the measurement requirement don’t apply. |
| vivo | Similar comment to Issue 1-7-1. UE behavior needs further study. |
| Nokia | Same as for issue 1-7-1. |
| Intel | Similar comment to Issue 1-7-1. |
| Huawei | Our view is that if after the MG reconfiguration, UE cannot perform the PRS measurement, then no measurement requirements apply. If UE can still measure PRS with new MG, then we can discuss further whether UE continues or restarts the measurement. This can be FFS for next meeting, as the issue is discussed for the first time. |
| Ericsson | We do not see need for such clarification. In issue 1-7-1 as described it can also done by the BS without the UE requesting it. |

## Companies views’ collection for 1st round

### Open issues

### CRs/TPs comments collection

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| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2104427  (ZTE) | Nokia : The draft CR cannot be endorsed. The CR correctly changes message names according to 37.355, however the change for the message *NR-TDOA-ProvideAssistanceData* towards *NR-DL-TDOA-ProvideLocationInformation* is incorrect, as first one is originated by UE and second one by LMF. Hence this should be modified into *NR-DL-TDOA-ProvideAssistanceData.* |
| Huawei: A comment on all the CRs, we suggest to merge all the CRs, and use one to capture the technical agreements. |
|  |
| R4-2104743  (CATT) | Nokia : Nokia: The draft CR still uses different terms for the frequency layer: PRS frequency layer and positioning frequency layer. It should always use the second term. Then we wonder why the term T\_(RSTD,i) is defined only at the end of the section, although it already appears in the first formula for RSTD total. |
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| R4-2106628  (vivo) | Nokia : We agree to changes regarding TPRS-RSTD,i and to positioning frequency layer term and Lprs definition. Muting option 1 has been adopted, which should be agreed first. |
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| R4-2106998  (HW) | Nokia: There is no consistent usage of the term positioning frequency layer in this draft CR.Muting option 1 has been adopted, which should be agreed in RAN4 first. Measurement period is extended by T if there are more than one MG occasion, which also needs to be agreed first. |
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| R4-2107160  (Ericsson) | Nokia: Formulas in the draft CR are not visible. Proposed changes are ok. However, there are more changes needed as contained in other draft CRs, so the changes can be merged with changes in other draft CRs. |
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## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

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|  | **Status summary** |
| **Sub-topic#1** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

*Recommendations on WF/LS assignment*

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|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| #1 |  |  |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provides recommendation on CRs/TPs Status update*

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| **CR/TP number** | **CRs/TPs Status update recommendation** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

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| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

# Topic #2: Other issues

## Companies’ contributions summary

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| --- | --- | --- |
| **T-doc** | **Company** | **Proposals / Observations** |
| [**R4-2106337**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106337.zip) | Qualcomm Incorporated | **Proposal 1: Use the term positioning frequency layer in the specification of requirements for NR positioning, consistent with the definition and understanding used by RAN1 and RAN2.**  **Proposal 2: PFL is counted as candidate for a MG occasion if at least one PRS resource on that PFL is fully covered (including at least the minimum number of repetitions specified in the accuracy requirements) by the MGL excluding RF switching time.**   * + **Proposal 3: Only one PRS frequency layer would compete for MG with other gap-based RRM measurements at a time**   + **Selection of the one PRS frequency layer for measurement is up to UE implementation.**   + **For PFLs that do not satisfy the long periodicity condition, CSSF would be calculated by counting only one PFL at a time. For PFLs that satisfy the long periodicity condition CSSF equals 1.**   + **For RRM frequency layers, N intermediate CSSF values would be calculated, where N is the number of PFLs and each intermediate CSSF value accounts for only one of the PFLs.**   + **FFS: The CSSF value for a RRM frequency layer could be the highest among the N intermediate CSSF values or chosen depending on [which] PFL is being processed at the time.**   **Proposal 4: max(Tprs \* X \* dl-prs-MutingBitRepetitionFactor)** ≥ **160 ms, where X is the length of NR-MutingPattern-r16 for mutingOption1-r16.**  **Observation 1: NR DL positioning measurement results reported by the UE are provided for uniquely identifiable PRS resources in the assistance data provided by the location server.**  **Proposal 5: The measurement requirements do not apply for a PRS resource, if time span of the PRS resource instance (including at least the minimum number of repetitions specified in the accuracy requirements) is greater than UE reported capability N.**  **Proposal 6: The measurement requirements do not apply for a PRS resource, if the time span of a DL PRS resource instance (including at least the minimum number of repetitions specified in the accuracy requirements) is greater than the configured measurement gap length.**  **NOTE: Proposal 6 is not needed if proposal 2 is adopted.**  **Proposal 7: The measurement requirements do not apply for a PRS resource, if the PRS resource is across two sampling duration of N within duration Lprs.**  **Proposal 8: The measurement requirements do not apply to any instance of a PRS resource that cannot be measured and processed in its entirety (including at least the minimum number of repetitions specified in the accuracy requirements) due to limitations imposed by either the UE PRS processing capability {N, T} or the configured measurement gap pattern.**  **Proposal 9: Remove MG pattern #25 as an applicable pattern for LTE measurement.**  **Proposal 10: When MG pattern #24 is used for LTE measurements, the measurement window is defined as the first 5ms after the RF re-tuning time and Tinter1 = 30 ms.** |
| [**R4-2106518**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106518.zip) | OPPO | **Proposal 1: As for counting the number of actually available MGsfor short-periodicity PRS layer i (the denominator of Ri), the candidate MG #j should be excluded under the following conditions:**   * **Case-1: when MG #j is within the processing time of any long-periodicity PRS in another MG #j-n, as illustrated in Figure 1, or** * **Case-2: when any long-periodicity PRS in another MG #j+n is within the processing time of PRS layer i in MG #j, as illustrated in Figure 2, or** * **Case-3: when MG #j contains any long-periodicity PRS, which is already captured in the spec above**   **Proposal 2: If muting pattern option 1 is applied, support option 1a:** t**he periodicity of a PRS resource is scaled by**   * **where is X \* dl-prs-MutingBitRepetitionFactor, and X is the size of NR-MutingPattern-r16 for mutingOption1-r16**   **Proposal 3: The applying order to scale the PRS periodicity should be:**   * **A): The PRS periodicity indicated by “*NR-DL-PRS-Periodicity-and-ResourceSetSlotOffset-r16*”** * **B): Scale the PRS periodicity based on muting pattern option 1** * **C): Derive the frequency layer specific periodicity if multiple periodicities are configured in this layer** * **D): Derive the available periodicity within MGs** * **E): Derive the effective periodicity based on PRS processing time**   **Proposal 4: could be used as the condition of long-periodicity PRS.**  **Proposal 5: Measurement requirements do not apply for the following three scenarios:**   * **When the time span of PRS resource instance > N, or** * **When the time span of PRS resource instance > MGL, or** * **When the time span of PRS resource instance being across two sampling duration of N within duration Lprs**   **Proposal 6: Remove MG pattern #25 as an applicable pattern for LTE measurement.**  **Proposal 7: Prefer not to limit this to 5 ms, and how to use MG pattern #24 for LTE measurement is up to UE implementation.** |
| [**R4-2106627**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106627.zip) | vivo | **Proposal 1: is revised to by taking muting into consideration, where is** *X \* dl-prs-MutingBitRepetitionFactor* **and** *X* **is the length of** *NR-MutingPattern-r16* ***for*** *DL-PRS-MutingOption1-r16****.***  **Proposal 2: The definition of long periodicity PRS measurement is based on option 1, i.e., the long periodicity of PRS measurement is >=320ms.**  **Proposal 3: A PFL is counted as candidate for a MG occasion if at least one PRS resource on that PFL is fully covered by the MGL excluding RF switching time.**  **Proposal 4: CSSF should be defined on per MG occasion basis, i.e., only one PRS frequency layer is counted as candidate for a MG occasion if at least one PRS resource occasion is fully covered by the MGL excluding RF switching time.**  **Proposal 5: Positioning frequency layer is used in RAN4 spec.**  **Proposal 6: The measurement requirements do not apply for a PRS resource instance, if the time span of a DL PRS resource instance is greater than the configured measurement gap.**  **Proposal 7: If time span of the PRS resource instance within MG is greater than UE reported capability N, measurement period requirements shall apply.**  **Proposal 8: For time span of PRS resource instance being across two sampling duration of N within duration Lprs, either option 2 or option 1 is fine.**  **Proposal 9: The measurement requirements do not apply to any instance of a PRS resource that cannot be measured and processed in its entirety due to limitations imposed by the configured measurement gap pattern.**  **Proposal 10: The measurement requirements shall apply to any instance of a PRS resource that cannot be measured and processed in its entirety during one timing period of UE processing capability {N, T}.**  **Proposal 11: MG#25 is not used for LTE measurement.**  **Proposal 12: No need to define LTE measurement window for MG#24.** |
| [**R4-2106631**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106631.zip) | vivo | Draft CR |
| [**R4-2107003**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2107003.zip) | Huawei, HiSilicon | **Proposal 1: A PFL is counted as candidate for a MG occasion if at least one PRS resource on that PFL is fully covered by the MGL excluding RF switching time.**  **Proposal 2: CSSF is derived in Rel-15 approach, and any PFL is counted as a candidate for a MG occasion as long as it fulfils the condition in Proposal 1.**  **Proposal 3: PRS frequency layer and SSB frequency layer are always handled as separated frequency layers in CSSF calculation.**  **Proposal 4a: Measurement of PFL i is defined as long periodicity measurement if Tavailable,i ≥320ms.**  **Proposal 4b: Measurement requirements apply provided that the resource periodicities after muting are either <= 160ms for all PRS resources on the PFL, or > 160ms for all PRS resources on the PFL.**  **Proposal 5a: An MG occasion is assumed to be taken by long periodicity measurement if any PFL categorized as long periodicity measurement is a candidate for this MG occasion.**  **Proposal 5b: No other MG occasion is assumed to be taken by long periodicity measurement.**  **Proposal 6: The measurement requirements do not apply for a PRS resource if**   * **the time span of the PRS resource instance is greater than UE reported capability N, or** * **the time span of a DL PRS resource instance is greater than the configured measurement gap length, or** * **the PRS resource is across two sampling duration of N within duration Lprs**   **Proposal 7: Remove MG pattern #25 as an applicable pattern for LTE measurement.**  **Proposal 8: No need to limit the measurement window for MG pattern #24 when used for LTE measurement.**  **Proposal 9: Adopt the term “Positioning frequency layer” in RAN4 spec.** |
| [**R4-2107004**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2107004.zip) | Huawei, HiSilicon | Draft CR |
| [**R4-2107005**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2107005.zip) | Huawei, HiSilicon | Draft CR |
| [**R4-2107184**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2107184.zip) | Nokia, Nokia Shanghai Bell | **Proposal 1 :** Regarding time span of PRS resource instance and UE processing capability, no further clarification is required in terms of the measurement period requirement.  **Observation 1 :** MG is configured to a UE, but not to cells regarding PRS transmission. Rel-16 PRS patterns and configurations have no dependency on LTE or NR.  **Proposal 2 :** We support option 2 that no change is needed to the current specification unless a UE has specific limitation to measure LTE cells with MGRP=160ms.  **Proposal 3 :** Option 1 “positioning frequency layer” should be used to avoid confusion among specs. |
| [**R4-2104742**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2104742.zip) | CATT | **Proposal 6: A PFL is counted as candidate for a MG occasion if a sufficient number of PRS symbols are contained within MGL excluding RF switching time.**  **Proposal 7: The definition of long periodicity measurement can be Tavailable,i≥[320]ms.**  **Proposal 8: Positioning frequency layer should be used in RAN4 specification.** |

## Open issues summary

### Sub-topic 2-1 CSSF

#### Issue 2-1-1: Candidate PFL for an MG occasion

*The issue is about under which condition a PFL is considered as a candidate for an MG occasion.*

*It is noted that the meaning of “PRS resource being fully covered by MGL excluding RF switching time” will be addressed generically in Issue 2-2-2.*

* Proposals
  + Option 1 (QC, vivo, HW)
    - PFL is counted as candidate for a MG occasion if at least one PRS resource on that PFL is fully covered by the MGL excluding RF switching time.
  + Option 2 (CATT)
    - A PFL is counted as candidate for a MG occasion if a sufficient number of PRS symbols are contained within MGL excluding RF switching time.
* Recommended WF
  + Further discuss

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| **Company** | **Comments** |
| CATT | Support option 2. When defining TPRS,i, the resources that partially overlapped with gap is considered, then this PFL should also be considered as candidate to be measured. |
| vivo | Due to the limited length of MGL of MG occasion and complicated PRS configurations, e.g., muting and repetition, it is likely that not all PRS resources on a PFL can be confined in the MG occasion. In our view as long as there is one PRS resource is covered in the MG occasion excluding RF switching time, it should compete the MG for measurements. So we support option 1. |
| OPPO | Support option 1. |
| Nokia | We prefer option 1. Option 2 leaves open, what is a sufficient number of PRS symbols. |
| Intel | We support Option 1. |
| Huawei | Support option 1.  As long as one PRS resource fall in the MG occasion, UE needs to find opportunity to measure the PFL in the MG occasion. |

#### Issue 2-1-2: Selection of one PFL in CSSF calculation

*In RAN4#98-e, it was agreed that for overlapping case, CSSF is only for the MG sharing between PRS and RRM layers, and to count only a single PRS layer for a gap occasion in CSSF calculation for both PRS and RRM layers. This issue is about which PLF is assumed to be measured when calculating CSSF for RRM measurement.*

* Proposals
  + Option 1 (QC)
    - Selection of the one PRS frequency layer for measurement is up to UE implementation
    - For RRM frequency layers, N intermediate CSSF values would be calculated, where N is the number of PFLs and each intermediate CSSF value accounts for only one of the PFLs.
    - FFS: The CSSF value for a RRM frequency layer could be the highest among the N intermediate CSSF values or chosen depending on [which] PFL is being processed at the time.
  + Option 2a (vivo)
    - CSSF should be defined on per MG occasion basis, i.e., only one PRS frequency layer is counted as candidate for a MG occasion if at least one PRS resource occasion is fully covered by the MGL excluding RF switching time.
  + Option 2b (HW)
    - CSSF is derived in Rel-15 approach, and any PFL is counted as a candidate for a MG occasion as long as at least one PRS resource on that PFL is fully covered by the MGL excluding RF switching time
* Recommended WF
  + Further discuss

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| **Company** | **Comments** |
| vivo | *This issue is about which PLF is assumed to be measured when calculating CSSF for RRM measurement.*  Following the above guidance from moderator, these options are not necessarily excluding each other. Based on Issue 2-1-1, option 2b is more accurate because PRS resource occasion may not be fully covered by MG. We in general are fine with option 2b. Meanwhile if they are multiple positioning frequency layers being candidate for a MG occasion then selection of the one PRS frequency layer for measurement is up to UE implementation. A combined option can be as follows.  Option 3: Any PFL is counted as a candidate for a MG occasion as long as at least one PRS resource on that PFL is fully covered by the MGL excluding RF switching time. Selection of the one PFL for measurement for the MG occasion is up to UE implementation. |
| Nokia | We consider that the PFL selection should not be left to UE implementation. Our preference is with option 2b, which allows to take into account one or more PFL’s as candidates for MG occasion. |
| Intel | Support Option 2a /2b.  In our understanding, the updated CSSF for PRS assumed that there is one and only one PRS layer shall be measured as we agreed before. So, we don’t agree Option 1. |
| Huawei | Support option 2b, which is aligned with Rel-15 approach for CSSF calculation. |

#### Issue 2-1-3: Frequency layer for PRS and RRM measurement

*The issue is about how to calculate CSSF for RRM measurements on a carrier frequency with PRS measurements.*

* Proposals
  + Option 1 (HW)
    - PRS frequency layer and SSB frequency layer are always handled as separated frequency layers in CSSF calculation
* Recommended WF
  + Further discuss

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| **Company** | **Comments** |
| CATT | Fine with option 1. |
| vivo | Support option 1 |
| Nokia | We support option1. |
| Intel | Support Option 1. |
| Huawei | Support option 1. It means there is no RRM measurements on a carrier frequency with PRS measurements. |
| Ericsson | Support option 1 |

#### Issue 2-1-4: Definition of long periodicity measurement

*The issue is about based on which criteria measurement for a PFL is categorized as long periodicity measurement.*

* Proposals
  + Option 1 (QC)
    - max(Tprs \* X \* dl-prs-MutingBitRepetitionFactor) ≥ 160 ms, where X is the length of NR-MutingPattern-r16 for mutingOption1-r16
  + Option 2a (OPPO, vivo, HW, CATT)
* Recommended WF
  + Further discuss
  + Besides the exact periodicity to be used for the classification, another difference between the two options is that in option 1, 160ms periodicity is also considered as long periodicity measurement.

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| **Company** | **Comments** |
| CATT | Support option 2a. Available PRS period should be used for defining long period PRS. |
| vivo | The measurement of long periodicity PRS is prioritized due to the scarcity of the PRS resources. It will take too long time to measure if it is not prioritized. So, to define long periodicity PRS measurement, it should be based on the scarcity of the PRS resources. Since the PRS based measurement is conducted in measurement gap, short periodicity of PRS resources doesn’t mean it can be measured in measurement gap as long as there is measurement gap. So, it would be reasonable to take measurement gap periodicity into consideration. Therefore option 2 is more reasonable as it takes muting, PRS periodicity and measurement gap periodicity into consideration. |
| OPPO | Support option 2a. Muting pattern and MG periodicity should be considered to derive the effective periodicity of PRS can be measured. As for the condition, >=320ms in LTE should be reused unless critical technical issues are identified. |
| Nokia | We support option 1, as 160 ms periodicity is supported as long-periodicity measurement and this may reduce latency of the positioning measurement. |
| Intel | Option 2 is preferred. |
| Huawei | Support to use Tavailable for defining long periodicity measurement, and we are open to discuss whether the threshold is 160ms or 320ms. |

#### Issue 2-1-5: Restriction on PRS resource periodicities on a PFL

*The issue is about whether some restrictions on PRS resource periodicities on a PFL are needed, from long v.s short periodicity measurement perspective.*

* Proposals
  + Option 1 (HW)
    - Measurement requirements apply provided that the resource periodicities after muting are either <= 160ms for all PRS resources on the PFL, or > 160ms for all PRS resources on the PFL
* Recommended WF
  + Further discuss

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| **Company** | **Comments** |
| CATT | Does it mean the resources on one PFL should be all long period or all short period? |
| vivo | If conclusion of Issue 2-1-4 is option 2a, then no restrictions on PRS resource periodicities are needed. |
| OPPO | Support option 1 since the mix of short-periodicity and long-periodicity PRS on the same PFL will complicate CSSF calculation. |
| Nokia | We don’t support option 1. The need for this restriction can be further discussed. |
| Huawei | Support option 1.  To CATT, yes, otherwise long periodicity measurement needs to be defined on per resource level instead of per PFL level. |

#### Issue 2-1-6: Parameter Ri

*The issue is about how to determine parameter Ri, which is the scaling factor for short-periodicity measurement, to account for MG occasions taken by high priority long-periodicity measurement. The current definition of Ri in 38.133 is copied for reference.*

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| Ri is the maximal ratio of the number of measurement gap where measurement object i is a candidate to be measured over the number of measurement gap where measurement object i is a candidate and not used for RSTD measurement with periodicity Tprs>160ms or with periodicity Tprs=160ms but prs-MutingInfo-r9 is configured within an arbitrary 1280ms period. |

* Proposals
  + Option 1 (OPPO)
    - As for counting the number of actually available MGs for short-periodicity PRS layer i (the denominator of Ri), the candidate MG #j should be excluded under the following conditions:
      * Case-1: when MG #j is within the processing time of any long-periodicity PRS in another MG #j-n, as illustrated in Figure 1, or
      * Case-2: when any long-periodicity PRS in another MG #j+n is within the processing time of PRS layer i in MG #j, as illustrated in Figure 2, or
      * Case-3: when MG #j contains any long-periodicity PRS, which is already captured in the spec above
  + Option 2 (HW)
    - Same as current Ri definition
      * An MG occasion is assumed to be taken by long periodicity measurement if any PFL categorized as long periodicity measurement is a candidate for this MG occasion.
      * No other MG occasion is assumed to be taken by long periodicity measurement.
* Recommended WF
  + Further discuss

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| **Company** | **Comments** |
| vivo | As long as long periodicity measurement is clearly defined, Ri definition would not be changed. |
| OPPO | Support option 1. Based on the principle of CSSF calculation, for a MG occasion containing long-periodicity PRS, long-periodicity PRS measurement is prioritized in spite of the short-periodicity PRS and other RRM signals. For a MG occasion not containing long-periodicity PRS, it should be shared by short-periodicity PRS and RRM. From this point, long-periodicity PRS and {short-periodicity PRS + RRM} can be measured in parallel (within different MG occasions) and could be considered as non-overlapping case. By using max manner in issue 1-4-2, the total measurement delay could be reduced significantly. |
| Nokia | Support option 2. |
| Intel | Support Option 2. |
| Huawei | Support option 2.  When multiple PFLs are measured, the total measurement period is the sum of measurement periods of each individual PFL, so there is no need to consider the impact from other PFL in defining CSSF for a PFL. |

### Sub-topic 2-2 Requirements applicability considering UE capability

#### Issue 2-2-1: Time span of PRS resource instance > N

*The issue is about whether measurement period requirements can apply can for a PRS resource when the time span of its instance is > reported capability N.*

*It is noted that the “time span” of a PRS resource instance may depends on whether UE measures all configured repetitions of the resource, or UE measures part of the configured repetitions.*

* Proposals
  + Option 1 (QC)
    - The measurement requirements do not apply for a PRS resource, if time span of the PRS resource instance (including at least the minimum number of repetitions specified in the accuracy requirements) is greater than UE reported capability N
  + Option 2 (OPPO, HW)
    - Measurement requirements do not apply for a PRS resource when the time span of PRS resource instance > N
  + Option 3 (vivo, Nokia)
    - If time span of the PRS resource instance within MG is greater than UE reported capability N, measurement period requirements shall apply
* Recommended WF
  + Further discuss
  + It is noted that one key point for all issues in sub-topic 2-2 is whether in the requirements UE is assumed to measure all configured repetitions of the resource, or part of the configured repetitions (minimum number of repetitions specified in the accuracy requirements)

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| **Company** | **Comments** |
| vivo | In our understanding, the current measurement period requirements should apply as the UE capability N has already been considered in the current requirements. UE may need multiple MG occasions to measure the PRS resource.  It may further depend on how accuracy requirements are specified, e.g., whether number of repetitions are one of the conditions for accuracy requirements. If accuracy requirements are specified for no repetition, then it would be up to UE implementation as long as measurement period and accuracy requirements are fulfilled. |
| OPPO | Support option 2. In our view, option 2 is to exclude scenario when single PRS instance without repetition is large UE capability. For example, when UE with N=0.5ms is configured to measure PRS {numberOfSymbol=12 in one slot, comb-12 for 15k SCS}, it is not expected to measure first 6 symbols in one MG occasion and second 6 symbols in the next MG occasion. |
| Nokia | We support option 3. |
| Intel | We prefer Option 2. The minimum repetition used is up to UE implementation. |
| Huawei | Suggest FFS.  Option 1 is a new UE measurement behaviour, and it means UE is assumed to measure part of the configured repetitions for a resource. We need more time to check.  Option 3 is assuming UE to make coherent combining across different PRS periods, which is not a typical implementation. |

#### Issue 2-2-2: Time span of PRS resource instance > MGL

*The issue is about whether measurement period requirements can apply can for a PRS resource when the time span of its instance is > MGL.*

* Proposals
  + Option 1 (QC)
    - The measurement requirements do not apply for a PRS resource, if the time span of a DL PRS resource instance (including at least the minimum number of repetitions specified in the accuracy requirements) is greater than the configured measurement gap length.
  + Option 2 (OPPO, vivo, HW)
    - Measurement requirements do not apply for a PRS resource when the time span of PRS resource instance > MGL
* Recommended WF
  + Further discuss

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| --- | --- |
| **Company** | **Comments** |
| CATT | Fine with option 2. |
| vivo | In our understanding, the current measurement period requirements do not apply as this condition has not been considered in the current requirements.  It may further depend on how accuracy requirements are specified, e.g., whether number of repetitions are one of the conditions for accuracy requirements. If accuracy requirements are specified for no repetition, then it would be up to UE implementation as long as measurement period and accuracy requirements are fulfilled. |
| OPPO | Support option 2. |
| Nokia | The scenario can be compared to partial overlap. In this case the measurement period needs to be longer to ensure that sufficient samples can be taken for the PRS resource. |
| Intel | Same comment as Issue2-2-1 |
| Huawei | Suggest FFS.  Option 1 is a new UE measurement behaviour, and it means UE is assumed to measure part of the configured repetitions for a resource. We need more time to check. |

#### Issue 2-2-3: Time span of PRS resource instance being across two sampling duration of N within duration Lprs

*The issue is about whether measurement period requirements can apply can for a PRS resource when the time span of its instance is across two sampling duration of N within duration Lprs.*

* Proposals
  + Option 1 (QC, OPPO, vivo, HW)
    - The measurement requirements do not apply for a PRS resource, if the PRS resource is across two sampling duration of N within duration Lprs
  + Option 2 (vivo)
    - UE may need to combine the PRS resource in the two sampling periods, or overlapped sampling window can be used if the issue exists
* Recommended WF
  + Further discuss

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| --- | --- |
| **Company** | **Comments** |
| vivo | Option 1 is also fine to simplify UE implementation. |
| OPPO | Support option 1. |
| Nokia |  |
| Intel | Support option 1. |
| Huawei | Support option 1. |

#### Issue 2-2-4: Generic pricniple

*The issue is about whether a generic rule for requirement applicability can be agreed regarding the time span of a PRS resource in comparison with MGL and reported capability N, and if so, whether and how it can be captured in the spec.*

* Proposals
  + Option 1 (QC)
    - The measurement requirements do not apply to any instance of a PRS resource that cannot be measured and processed in its entirety (including at least the minimum number of repetitions specified in the accuracy requirements) due to limitations imposed by either the UE PRS processing capability {N, T} or the configured measurement gap pattern.
  + Option 2 (HW)
    - Agree with the generic principle except the repetition part, but prefer to capture the exact cases than generic rules in the spec.
* Recommended WF
  + Further discuss

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| --- | --- |
| **Company** | **Comments** |
| CATT | The exact cases are discussed in other issues in sub-topic 2-2. No need to have this generic principle repeatedly. |
| vivo | The identified cases have been discussed in Issues 2-2-1, 2-2-2, 2-2-3. The generic principle may not be needed. |
| Intel | Same comment as Issue2-2-1 |
| Huawei | Support option 2. |

### Sub-topic 2-3 Use of MG pattern #24 and #25 for LTE RRM measurement

#### Issue 2-3-1: Whether MG pattern #25 is an applicable pattern for LTE measurement

*The issue is about whether MG pattern #25 is an applicable pattern for LTE measurement.*

* Proposals
  + Option 1 (QC, OPPO, vivo, HW)
    - Remove MG pattern #25 as an applicable pattern for LTE measurement
  + Option 2 (Nokia)
    - no change is needed to the current specification unless a UE has specific limitation to measure LTE cells with MGRP=160ms
* Recommended WF
  + Further discuss

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| --- | --- |
| **Company** | **Comments** |
| CATT | What does option 1 indicate? Does it mean UE cannot perform LTE measurement if gap pattern #25 is configured? |
| vivo | Support option 1.  To CATT: In our understanding, if there is any LTE MO being configured, MG pattern #25 cannot be configured simultaneously. |
| Nokia | We wonder what a main difficulty is to support LTE cells with MGRP=160ms. In positioning measurements cases, there are no difference due to MGRP. Measurement gap is UE configuration not gNB/eNB configuration, so we want to understand why LTE/NR cell becomes a matter due to MGRP? |
| Intel | Support Option 1 |
| Huawei | Support option 1.  In our understanding, using MG pattern #24 with 160ms MGRP may require a new UE implementation as it is not supported with any of the existing MG patterns 0~23. Also, there is no requirements defined for LTE measurement based on 160ms MGRP. |
| Ericsson | Support option 1. |

#### Issue 2-3-2: Measurement window when MG pattern #24 is used for LTE measurement

*The issue is about whether a 5ms window should be defined within the MGL of MG pattern #24 for UE to use the pattern for LTE measurement.*

* Proposals
  + Option 1 (QC)
    - When MG pattern #24 is used for LTE measurements, the measurement window is defined as the first 5ms after the RF re-tuning time and Tinter1 = 30 ms
  + Option 2 (OPPO, vivo, HW)
    - not to limit this to 5 ms, and how to use MG pattern #24 for LTE measurement is up to UE implementation
* Recommended WF
  + Further discuss

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| --- | --- |
| **Company** | **Comments** |
| CATT | Support option 2. |
| vivo | Support option 2. |
| OPPO | Support option 2. |
| Nokia | We support option 2. There should be no restriction for the measurement window. |
| Intel | Support Option 2 |
| Huawei | Support option 2.  On option 1, we support to clarify that Tinter1 = 30 ms, but there may be no need to limit where the 5ms measurement window is located in the 10ms MGL. |
| Ericsson | Support option 2 |

### Sub-topic 2-4 Terminology

#### Issue 2-4-1: Terminology for frequency layer to be measured for positioning

*The issue is about which term should be used to refer to a frequency layer where UE performs PRS measurement.*

* Proposals
  + Option 1 (QC, Intel, vivo, HW, Nokia, CATT)
    - Positioning frequency layer
* Recommended WF
  + It seems all companies support option 1. Suggest to agree the following bullet
    - The term “positioning frequency layer” will be used in 38.133
  + Please indicate if you have any concern

|  |  |
| --- | --- |
| **Company** | **Comments** |
| CATT | Agree with the recommended WF. |
| ZTE | Support the recommended WF. |
| vivo | Agree with the recommended WF. |
| OPPO | Agree with the recommended WF. |
| Intel | Agree the recommend WF |
| Huawei | Agree with the recommended WF. |
| Ericsson | Agree with the recommended WF. |

## Companies views’ collection for 1st round

### Open issues

### CRs/TPs comments collection

*Major close to finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2106631  (vivo) | Huawei: A comment on all the CRs, we suggest to merge all the CRs, and use one to capture the technical agreements. |
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|  |
| R4-2107004  (HW) |  |
|  |
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| R4-2107005  (HW) |  |
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## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

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| --- | --- |
|  | **Status summary** |
| **Sub-topic#1** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

*Suggestion on WF/LS assignment*

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| --- | --- | --- |
|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| #1 |  |  |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provided recommendation on CRs/TPs Status update suggestion*

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| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

|  |  |
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| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

# Topic #3: PRS-RSRP measurement period

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc** | **Company** | **Proposals / Observations** |
| [**R4-2106335**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106335.zip) | Qualcomm Incorporated | **Proposal 1: The RSTD measurement period requirement is independent of whether or not PRS-RSRP is configured to be reported for DL-TDOA. According to a prior agreement, RAN4 may revise the number of samples () in the requirement if more samples are needed to meet PRS-RSRP accuracy requirements.**  **Proposal 2: The UE Rx-Tx measurement period requirement is independent of whether or not PRS-RSRP is configured to be reported for Multi-RTT. According to a prior agreement, RAN4 may revise the number of samples () in the requirement if more samples are needed to meet PRS-RSRP accuracy requirements.** |
| [**R4-2106625**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106625.zip) | vivo | **Proposal 1: UE bahviour is not defined when PRS-RSRP is configured additionally to RSTD or UE Rx-Tx measurement.**  **Proposal 2: Current requirements in clause 9.9.3 also apply for the case when PRS-RSRP is measured for DL-TDOA or Multi-RTT.** |
| [**R4-2106629**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106629.zip) | vivo | Draft CR |
| [**R4-2106999**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106999.zip) | Huawei, HiSilicon | **Proposal: Requirements in clause 9.9.3 also apply for the case when PRS-RSRP is measured for DL-TDOA or Multi-RTT.** |
| [**R4-2107000**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2107000.zip) | Huawei, HiSilicon | Draft CR |
| [**R4-2107161**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2107161.zip) | Ericsson | * ***Observation 1****: When UE is configured with RSTD and PRS-RSRP, both measurements shall meet the accuracy.* * ***Proposal 1****: UE behavior when PRS-RSRP is configured together with RSTD/UE Rx-Tx and the required PRS-RSRP measurement period is* ***shorter*** *than that for RSTD/UE Rx-Tx (configured without PRS-RSRP), then the PRS-RSRP measurement continues over the entire RSTD/UE Rx-Tx measurement period.* * ***Observation 2****: For UE Rx-Tx and RSTD, it is the opposite to Proposal 1, but the general rules when two measurements are configured together shall be that the measurement with the shorter required measurement period shall continue until the measurement with the longer measurement period is complete. Otherwise, PRS-RSRP measurement is not useful if it is taken over different PRSs than the other measurement.* |
| [**R4-2107162**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2107162.zip) | Ericsson | Draft CR |
| [**R4-2107182**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2107182.zip) | Nokia, Nokia Shanghai Bell | **Proposal 1:** Regarding UE behavior, a UE continues to measure PRS-RSRP over the entire RSTD/UE Rx-Tx measurement period, when PRS-RSRP is configured together with RSTD/UE Rx-Tx.  **Proposal 2:** RSRP requirements in clause 9.9.3 also apply for the case when configuring PRS-RSRP with RSTD or UE Rx-Tx. |

## Open issues summary

### Sub-topic 3-1 Measurement period when configured with RSTD or UE Rx-Tx

#### Issue 3-1-1: PRS-RSRP requirements when configured for DL-TDOA or multi-RTT

*The issue is about the UE behavior and requirements for PRS-RSRP measurement configured for DL-TDOA and multi-RTT. It is noted that whether RSTD (or UE Rx-Tx) measurement period is impacted by PRS-RSRP is addressed in Issue 1-5-1, and here the focus is on PRS-RSRP.*

* Proposals
  + Option 1 (QC)
    - According to a prior agreement, RAN4 may revise the number of samples () in the requirement if more samples are needed to meet PRS-RSRP accuracy requirements.
  + Option 2a (vivo, HW)
    - UE behaviour is not defined when PRS-RSRP is configured additionally to RSTD or UE Rx-Tx measurement.
    - Current requirements in clause 9.9.3 also apply for the case when PRS-RSRP is measured for DL-TDOA or Multi-RTT.
  + Option 2b (Nokia)
    - Regarding UE behavior, a UE continues to measure PRS-RSRP over the entire RSTD/UE Rx-Tx measurement period, when PRS-RSRP is configured together with RSTD/UE Rx-Tx.
    - RSRP requirements in clause 9.9.3 also apply for the case when configuring PRS-RSRP with RSTD or UE Rx-Tx.
  + Option 3 (Ericsson)
    - UE behavior when PRS-RSRP is configured together with RSTD/UE Rx-Tx and the required PRS-RSRP measurement period is shorter than that for RSTD/UE Rx-Tx (configured without PRS-RSRP), then the PRS-RSRP measurement continues over the entire RSTD/UE Rx-Tx measurement period.
* Recommended WF
  + Further discuss

|  |  |
| --- | --- |
| **Company** | **Comments** |
| CATT | Fine with option 2a. |
| vivo | Support option 2a |
| OPPO | Support option 2a. |
| Nokia | Option 2b and option-3 are same. We support 2b and option 3. Otherwise RSTD or UE Rx-Tx is outdated if joint reporting is used. |
| Intel | Support Option 2a/2b |
| Huawei | Support option 2a.  On option 1, so far there is no clear need to update the number of samples for PRS-RSRP measurement. On option 2b, we understand it is technically same as option 2a. On option 3, it’s not clear when such case would happen. |

## Companies views’ collection for 1st round

### Open issues

### CRs/TPs comments collection

*Major close to finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2106629  (vivo) | Nokia : Term positioning frequency layer should be consistently used. Muting option 1 is still to be agreed. |
| Huawei: A comment on all the CRs, we suggest to merge all the CRs, and use one to capture the technical agreements. |
|  |
| R4-2107000  (HW) | Nokia : Term positioning frequency layer should be consistently used. Muting option 1 is still to be agreed. The option to prolong measurement duration by T ms needs still to be agreed. |
|  |
|  |
| R4-2107162  (Ericsson) | Nokia : CR is agreeable. |
|  |
|  |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary** |
| **Sub-topic#1** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

*Suggestion on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| #1 |  |  |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provided recommendation on CRs/TPs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

# Topic #4: UE Rx-Tx time difference measurement period

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc** | **Company** | **Proposals / Observations** |
| [**R4-2104742**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2104742.zip) | CATT | **Proposal 1: SRS periodicity should not be accounted in measurement period.**  **Proposal 2: SRS dropping should not be accounted in measurement period** **but the clarification can be added in the requirements that the measurement period can be longer in some cases.**  **Proposal 3: The measurement requirements is applicable only if any SRS transmission is within [-160, 160] msec of at least one DL PRS resource of each of the TRPs in the assistance data. Accuracy requirements are independent of PRS and SRS separation.**  **Proposal 4: UE shall continue UE Rx-Tx time difference measurement but UE Rx-Tx time difference measurement requirements may not apply when TA change (due to TA command or UE autonomous adjustment).**  **Proposal 5: No need to clarify UE Rx-Tx measurement requirements in case of NTA\_offset change.** |
| [**R4-2104744**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2104744.zip) | CATT | Draft CR |
| [**R4-2106336**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106336.zip) | Qualcomm Incorporated | **Proposal 1: The UE Rx-Tx measurement period does not need to explicitly consider SRS periodicity (option 1). Instead, SRS/PRS proximity requirements should be adopted as applicability condition.**  **Proposal 2: SRS dropping should not be accounted for in the UE Rx-Tx measurement period and existing requirements apply.**  **Proposal 3: The measurement requirements for UE Rx-Tx timing difference is applicable only if the configured parameters SRS-PeriodicityAndOffset of the SRS resources for positioning are such that at least one SRS transmission is within [-80, +80] ms of at least one DL PRS resource instance from each of the TRPs in the assistance data.**  **Proposal 4: UE Rx-Tx time difference measurement requirements are not applicable if TA command is received during the measurement period.**  **Proposal 5: UE shall continue UE Rx-Tx time difference measurement and UE Rx-Tx time difference measurement requirements shall apply when there is an autonomous UL timing adjustment during the measurement period (option 1).**  **Observation 1: The issue with UL timing changes occurring during the UE Rx-Tx measurement period is their effect on gNB Rx-Tx measurements and, ultimately, RTT.**  **Proposal 6: It is clarified in the specifications (section 9.9.4 in TS 38.133) that UE Rx-Tx measurement requirements are not applicable if the NTA\_offset changes during the measurement period.**  **Proposal 7: If the serving cell (PCell, PSCell, or SCell) configured with the SRS for positioning changes during the measurement period, UE Rx-Tx measurement requirements do not apply.**  **Proposal 8: UE Rx-Tx measurement requirements in the case of serving cell changes other than HO that do not impact the configuration of SRS for positioning are FFS.** |
| [**R4-2106453**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106453.zip) | Intel Corporation | **Observation 1: UE Rx-Tx measurement time does NOT depend SRS periodicity but SRS proximity (e.g. the closest “j”th UL SRS subframe to UE reception time for “i”th DL PRS subframe).**  **Observation 2: UE Rx-Tx time difference measurement period delay relies on DL PRS reception and processing time ONLY because SRS transmission timing can be pre-known by UE before UE detected DL PRS timing successfully.**  ***Proposal 1: UE Rx-Tx measurement delay requirements in [2] can be applied when SRS/PRS proximity condition was met.***  ***Proposal 2: It needs NOT to take SRS dropping count into UE Rx-Tx measurement delay requirements.***  **Observation 3: If the timing adjustment changes are same for both UE Rx-Tx measurement and gNB Rx-Tx measurement, the positioning estimation error due to TA change can be neglected.**  **Observation 4: It is also possible to introduce some positioning accuracy error if TA updates when UE Rx-Tx time difference measurement and gNB Rx-Tx time difference measurement are variable.**  ***Proposal 3: UE could continue UE/gNB Rx-Tx time difference measurement during which timing adjustment for its UL transmissions. But whether the accuracy requirements shall be applicable to such case can be FFS.***  **Observation 5: NR UE Rx-Tx time difference measurement accuracy requirements can be applicable when the following condition was satisfied:**  **“The measurement requirements for UE Rx-Tx timing difference is applicable only if the configured parameters SRS-Slot-offset and SRS-Periodicity for SRS resource for positioning are such that any SRS transmission is within [-160, 160] ms”**  ***Proposal 4: RAN4 to define Rx-Tx time difference requirements only for the case where SRS resource is in the same band as PRS resource.*** |
| [**R4-2106516**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106516.zip) | OPPO | **Proposal 1: On proximity between SRS and PRS, support option 1 with X=160ms.**  **Proposal 2: Support option 1, SRS periodicity should not be accounted in measurement period.**  **Proposal 3: Support option 1, SRS dropping should not be accounted in measurement period.**  **Proposal 4: In case of cell change impacting SRS configuration, support option 3 that the UE shall restart the UE Rx-Tx time difference measurement after the SRS reconfiguration on the target cell is complete**  **Proposal 5: In case of cell change not impacting SRS configuration, support option 2 that the UE shall continue the on-going UE Rx-Tx time difference measurement, and longer measurement period is expected.**  **Proposal 6: In case of TA change due to TA command, the UE shall discard the UE Rx-Tx time difference measurement, and the UE Rx-Tx time difference measurement requirement are not applicable.**  **Proposal 7: In case of TA change due to UE autonomous adjustment, UE shall continue Rx-Tx time difference measurement.**  **Proposal 8: In case of NTA\_offset change, the requirements including measurement period and accuracy requirements for UE Rx-Tx time difference measurement do not apply.** |
| [**R4-2106517**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106517.zip) | OPPO | Draft CR |
| [**R4-2106626**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106626.zip) | vivo | **Proposal 1:****UE Rx-Tx time difference measurement requirements are applicable only if any SRS transmission is within [-160, 160] msec of at least one DL PRS resource of each of the TRPs in the assistance data.**  **Proposal 2: SRS periodicity is not accounted in UE Rx-Tx time difference measurement period requiremetns.**  **Proposal 3: SRS dropping is not accounted in UE Rx-Tx time difference measurement period requiremetns.**  **Proposal 4: The UE shall discard the UE Rx-Tx time difference measurement if the uplink transmission timing (based on network-configured TA) changes during the UE Rx-Tx measurement period.**  **Proposal 5:****UE Rx-Tx time difference measurement requirements are not applicable if TA command is received during the measurement period.**  **Proposal 6: UE shall continue UE Rx-Tx time difference measurement and UE Rx-Tx time difference measurement requirements shall apply if UE autonomous adjustment happens during measurement period.**  **Proposal 7: The UE shall discard the UE Rx-Tx time difference measurement if NTA-offset changes during the UE Rx-Tx measurement period.**  **Proposal 8:****UE Rx-Tx time difference measurement requirements are not applicable if NTA-offset changes during the measurement period.**  **Proposal 9: For the cell change impacting SRS configuration, the same requirements as for handover can be reused.**  **Proposal 10: For the cell change not impacting SRS configuration, the UE shall continue the on-going UE Rx-Tx time difference measurement and the current measurement period applies.** |
| [**R4-2106630**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106630.zip) | vivo | Draft CR |
| [**R4-2107001**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2107001.zip) | Huawei, HiSilicon | **Proposal 1: SRS periodicity or SRS dropping is not accounted in UE Rx-Tx time difference measurement period.**  **Proposal 2: The measurement requirements for UE Rx-Tx timing difference is applicable provided that any SRS transmission is within [-X, +X]ms of at least one DL PRS resource of each TRP, where X = 80 or 160ms.**  **Proposal 3: UE Rx-Tx measurement period is not impacted by UL timing change (either due to network TA, UE autonomous time adjustment or NTA\_offset change).**  **Proposal 4a: If any of the the serving cell (PCell, PSCell, or SCell) configured with the SRS for positioning changes during the measurement period, UE restarts the Rx-Tx measurement.**  **Proposal 4b: If any of the the serving cell (PCell, PSCell, or SCell) NOT configured with the SRS for positioning changes during the measurement period, UE continues the Rx-Tx measurement. No need to capture this in the spec.** |
| [**R4-2107002**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2107002.zip) | Huawei, HiSilicon | Draft CR |
| [**R4-2107163**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2107163.zip) | Ericsson | * ***Proposal 1****: When UE Rx-Tx is configured together with PRS-RSRP and the required PRS-RSRP measurement period is longer than that for UE Rx-Tx (configured without PRS-RSRP), then the UE Rx-Tx measurement continues over the entire PRS-RSRP measurement period.* * ***Observation 1****: Option 1 (Whether SRS dropping should be accounted in measurement period: No) is ambiguous, since it is not clear which requirement applies when the dropping does occur.* * ***Proposal 2****: UE is allowed to extend the UE Rx-Tx measurement period (clarified in the requirements), but the exact value is not specified (aligned with RAN4 agreement on PRS dropping).* * ***Observation 2****: SRS and PRS are configured by different network nodes (serving cell and LMF/neighbor cells, respectively).* * ***Observation 3****: The SRS is always transmitted to the serving cell while PRS may have to be received from non-collocated neighbor cells.* * ***Observation 4****: The network cannot guarantee that SRS and PRS occur in a certain time relation and/or with the same periodicity. Even the first SRS may be transmitted much later or get never transmitted in the worst case.* * ***Proposal 3****: can be extended if the SRS periodicity is longer than max()* * ***Proposal 4****: The requirements for UE Rx-Tx apply provided MIN(Tsrs, Tprs) ≤ 2\*X; X = FFS (e.g. X = 160 ms).* * ***Proposal 5****: It is clarified in UE Rx-Tx measurement requirements (section 9.9.4 in TS 38.133) that the UE shall discard the UE Rx-Tx measurement if the NTA\_offset changes during the measurement period.* * ***Observation 5****: Neighbor cells are not aware of network-configured TA. Neither serving cell nor neighbor cell is aware of autonomous timing adjustments.* * ***Observation 6****: For gNB, it has been already agreed that in both serving and neighbor cells of the UE, gNB Rx-Tx accuracy shall not apply if UE transmit timing changes due to gNB sending Timing Advanced (TA) during the measurement period.* * ***Proposal 6****: The UE shall discard the UE Rx-Tx time difference measurement if the uplink transmission timing (autonomous or based on network-configured TA) changes during the UE Rx-Tx measurement period.* * ***Proposal 7****: The UE Rx-Tx time difference measurement is restarted if the serving cell (PCell, PSCell, or SCell), which is configured with the SRS for the measurement, changes during the measurement period TUERx-Tx,Total. In this case, the UE shall restart the UE Rx-Tx time difference measurement after the SRS reconfiguration on the target cell is complete. Otherwise, if the serving cell is not configured with the SRS for positioning, the UE shall continue the on-going UE Rx-Tx time difference measurement after the serving cell change, while meeting the accuracy requirements in clause 10.1.25.* |
| [**R4-2107164**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2107164.zip) | Ericsson | Draft CR |
| [**R4-2107183**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2107183.zip) | Nokia, Nokia Shanghai Bell | **Proposal 1 :** We support option-1. SRS periodicity and SRS dropping are not considered for the requirements.  **Observation 1 :** In certain UL transmission conditions, SRS-P scheduling and transmission may not meet the proximity condition, since SRS-P transmission has the lowest transmission priority in Rel-16.  **Observation 2 :** As one concern, a UE may not complete a measurement report, if SRS-P scheduling transmission may not meet the proximity condition.  **Proposal 2 :** Even without PRS/SRS proximity condition, UE RX-TX time measurement and report should work within the required measurement period. Accuracy requirement impact can be FFS.  **Observation 3 :** Measurement period is not significantly changed due to TA change, and measurement period requirement is still applicable.  **Proposal 3 :** Regarding TA change due to TA commend or autonomous adjustment, we support option 1. A UE shall continue UE Rx-Tx time difference measurement and meet accuracy requirements  **Proposal 4 :** Regarding cell change impacting SRS configuration, we support option-3 : if the serving cell (PCell, PSCell, or SCell) configured with the SRS for the measurement, changes during the measurement period, UE Rx-Tx time difference measurement is restarted, after the SRS reconfiguration on the target cell is complete.  **Proposal 5 :** Regarding cell change not impacting SRS configuration, we support option-1 : if the serving cell (PSCell or SCell) changes while not configured with the SRS for positioning, the UE shall continue the on-going UE Rx-Tx time difference measurement |

## Open issues summary

*It is noted that Proposal 4 from Intel R4-2106453 is not listed as an open issue. It has been agreed in R4-2017372 that Basic requirements for UE Rx-Tx time difference measurements shall be based on the assumption that positioning SRS resources are in the same band as PRS frequency layer, so there is no need to re-open the discussion. Please Intel check and indicate if something is missed.*

*It is noted that Proposal 1 from Ericsson* *R4-2107163 is not listed as an open issue. The same issue for RSTD is addressed in Issue 1-5-1, and it has been agreed in R4-2017372 that UE Rx-Tx would follow the same conclusion as for RSTD, so there is no need to repeat the same discussion for UE Rx-Tx. Please Ericsson check and indicate if something is missed.*

### Sub-topic 4-1 SRS impact

#### Issue 4-1-1: Whether SRS periodicity should be accounted in measurement period

*The issue is about* *whether SRS periodicity should be accounted in measurement period.*

* Proposals
  + Option 1a (CATT, QC, Intel, OPPO, vivo, HW, Nokia)
    - No, and the SRS impact may be accounted by SRS/PRS proximity
  + Option 2 (Ericsson)
    - can be extended if the SRS periodicity is longer than max().
* Recommended WF
  + Further discuss

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| --- | --- |
| **Company** | **Comments** |
| CATT | Support option 1a. |
| vivo | Support option 1a. |
| OPPO | Support option 1a. |
| Nokia | We do not see any impact on the measurement period due to long SRS periodicity, since there should be some proximity between PRS and SRS and hence long SRS periodicities should be avoided. |
| Intel | Option 1a |
| Huawei | Support option 1a. |
| Ericsson | We can compromise to option 1a |

#### Issue 4-1-2: Whether SRS dropping should be accounted in measurement period

*The issue is about* *whether SRS dropping should be accounted in measurement period.*

* Proposals
  + Option 1 (CATT, Ericsson)
    - UE is allowed to extend the UE Rx-Tx measurement period (clarified in the requirements), but the exact value is not specified (aligned with RAN4 agreement on PRS dropping)
  + Option 2 (QC, Intel, OPPO, vivo, HW, Nokia)
    - No, and existing requirements apply
* Recommended WF
  + Further discuss

|  |  |
| --- | --- |
| **Company** | **Comments** |
| vivo | Support option 2 |
| OPPO | Support option 2. |
| Nokia | We support Option-2. |
| Intel | Option 2 |
| Huawei | Support option 2. |
| Ericsson | We can compromise to option 2 |

#### Issue 4-1-3: PRS/SRS proximity

*The issue is about* *whether and how to define proximity between SRS and PRS as a condition for the UE Rx-Tx measurement requirements. The intention is to make sure UE Rx-Tx and gNB Rx-Tx are measured in close time.*

*It is noted that Proposal 3 from QC R4-2106336 and Observation 5 from Intel R4-2106453 is captured as option 1, though the wording are not exactly the same. Please QC and Intel check and indicate if you would like to split for another option.*

* Proposals
  + Option 1a (CATT, QC, Intel, OPPO, vivo, HW)
    - The measurement requirements is applicable only if any SRS transmission is within [-X, X] msec of at least one DL PRS resource of each of the TRPs in the assistance data.
    - Accuracy requirements are independent of PRS and SRS separation
      * X = 160 (CATT, Intel, OPPO, vivo, HW)
      * X=80 (QC, HW)
  + Option 2 (Ericsson)
    - The requirements for UE Rx-Tx apply provided MIN(Tsrs, Tprs) ≤ 2\*X; X = FFS (e.g. X = 160 ms).
  + Option 3 (Nokia)
    - Even without PRS/SRS proximity condition, UE RX-TX time measurement and report should work within the required measurement period.
    - Accuracy requirement impact can be FFS.
* Recommended WF
  + Further discuss

|  |  |
| --- | --- |
| **Company** | **Comments** |
| CATT | Support option 1. |
| vivo | Support option 1a with X=160ms. |
| OPPO | Support option 1a. |
| Nokia | We have one question, if this PRS-SRS proximity condition is not met, then the UE does not report UE Rx-Tx measurement? We wonder an impact if there is not this condition.  Also, the proximity is related with SRS-P configuration/priority issue. SRS-P has the lowest priority of UE transmission in RAN1 spec. Anyway, gNB can schedule SRS-P as the proximity condition, then it may mandate a UE to transmit of SRS-P with priority in certain cases, if it meets the PRS-SRS proximity condition?  We agree that PRS-SRS proximity helps to reduce latency, measurement period and mobility impact. As a minimum requirement SRS transmission can be within [-160 , 160] ms from any DL PRS resource of each of TRPs. |
| Intel | Option 1a |
| Huawei | Support option 1a.  In our view, option 2 is a subset of option 1a, i.e. when the PRS/SRS configuration meets the condition in option 2, it will always meet the condition of option 1. On the other hand, option 1 can allow larger PRS and SRS periodicity if NW carefully plan the offsets. |
| Ericsson | We support option 2. But we can compromise to option 1a but with X=160 ms |

### Sub-topic 4-2 Measurement period requirements with TA change

#### Issue 4-2-1: TA change due to TA command

*The issue is about* *UE behavior and requirements when UL timing change due to TA command occurs during UE Rx-Tx measurement period.*

*It is noted that Proposal 3 from Intel R4-2106453 and Proposal 3 from Nokia R4-2017183 discuss about accuracy requirements. It has been agreed in R4-2008664 that accuracy requirements do not apply in this case, so this part is not captured in the options.*

* Proposals for UE behaviour
  + Option 1 (CATT, Intel, HW, Nokia)
    - UE shall continue UE Rx-Tx time difference measurement
  + Option 2 (QC)
    - Up to UE implementation
  + Option 2 (OPPO, vivo, Ericsson)
    - UE shall discard the UE Rx-Tx time difference measurement
* Proposals for requirements
  + Option 1 (CATT, QC, OPPO, vivo)
    - UE Rx-Tx time difference measurement requirements may not apply
  + Option 2 (HW, Nokia)
    - UE Rx-Tx measurement period is not impacted by UL timing change
* Recommended WF
  + Further discuss

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| --- | --- |
| **Company** | **Comments** |
| vivo | UE Rx-Tx time difference measurement requirements do not apply if TA changes due to TA command as it cannot be compensated when determining UE location. It is unclear why UE continues the measurement which is not useless for deciding location. |
| OPPO | For UE behavior, we prefer to discard the Rx-Tx time difference measurements and are also fine to leave it for UE implementation. For requirements, we support option 1. |
| Nokia | RAN1 has discussed about TA issues in RTT methods, some solutions have been proposed. It makes sense at least to let a UE continue to make measurements regardless of TA change in RAN4 point of view.  If a UE discards the UE Rx-Tx time difference measurements, we have a concern that it limits RTT use case of mobile UEs. In addition with a proximity condition between PRS and SRS the probability of a TA change during the measurement can be lowered. |
| Intel | For UE behavior, we support Option 1. For requirements, Option 1 |
| Huawei | Support option 1.  We suggest to define same UE behavior and requirements for all cases of UL timing change, as the impacts to multi-RTT positioning is similar. We think the UE could continue the Rx-Tx measurement, and the current measurement period requirements can apply.  The accuracy requirements can be discussed separately. |
| Ericsson | We support option 2 (UE behaviour) and option 1 (requirements).  But we are also fine to define this only in the accuracy requirements. |

#### Issue 4-2-2: TA change due to UE autonomous adjustment

*The issue is about* *UE behavior and requirements when UL timing change due to UE autonomous timing adjustment occurs during UE Rx-Tx measurement period.*

* Proposals for UE behaviour
  + Option 1 (CATT, QC, Intel, OPPO, vivo, HW, Nokia)
    - UE shall continue UE Rx-Tx time difference measurement
  + Option 2 (Ericsson)
    - The UE shall discard the UE Rx-Tx time difference measurement
* Proposals for requirements
  + Option 1 (CATT)
    - UE Rx-Tx time difference measurement requirements may not apply
  + Option 2 (QC, vivo, HW, Nokia)
    - UE Rx-Tx time difference measurement requirements apply
* Recommended WF
  + Further discuss

|  |  |
| --- | --- |
| **Company** | **Comments** |
| vivo | Support Option 1 for UE behavior and option 2 for requirements. |
| OPPO | Support option 1 for UE behavior and option 2 for requirements. |
| Nokia | Same as above. |
| Huawei | Same comment as issue 4-2-1. |
| Ericsson | Same as in issue 4-2-1.  We support option 2 (UE behaviour) and option 1 (requirements).  But we are also fine to define this only in the accuracy requirements. |

#### Issue 4-2-3: TA change due to NTA\_offset change

*The issue is about* *UE behavior and requirements when UL timing change due to NTA\_offset change occurs during UE Rx-Tx measurement period.*

* Proposals
  + Option 1 (CATT, HW, QC)
    - No need to clarify UE Rx-Tx measurement requirements in case of NTA\_offset change
  + Option 2a (QC, OPPO, vivo)
    - It is clarified in UE Rx-Tx measurement requirements (section 9.9.4 in TS 38.133) that measurement requirements are not applicable if the NTA\_offset changes during the measurement period
  + Option 2b (Ericsson)
    - It is clarified in UE Rx-Tx measurement requirements (section 9.9.4 in TS 38.133) that the UE shall discard the UE Rx-Tx measurement if the NTA\_offset changes during the measurement period.
* Recommended WF
  + Further discuss

|  |  |
| --- | --- |
| **Company** | **Comments** |
| CATT | Support option 1. |
| vivo | Support option 2a. Similar UE behavior as for TA command can be reused for this case. |
| OPPO | Support option 2a. |
| Nokia | We support option 2b. We do not consider NTA\_offset change to be frequent. |
| Huawei | Same comment as issue 4-2-1. |
| Ericsson | We support option 2b (UE behaviour) but can also accept 2a (requirements).  But we are also fine to define this only in the accuracy requirements. |

### Sub-topic 4-3 Measurement period requirements with cell change

#### Issue 4-3-1: Measurement period requirements with cell change impacting SRS

*The issue is about* *UE behavior and requirements when cell change that impacts SRS transmission occurs during UE Rx-Tx measurement period.*

* Proposals
  + Option 1 (QC)
    - UE Rx-Tx measurement requirements do not apply
  + Option 2 (OPPO, vivo, HW, Ericsson, Nokia)
    - UE shall restart the UE Rx-Tx time difference measurement after the SRS reconfiguration on the target cell is complete
* Recommended WF
  + Further discuss

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| --- | --- |
| **Company** | **Comments** |
| CATT | Fine with option 2. |
| vivo | Option 2 is fine. |
| Nokia | Support option 2. |
| Huawei | Support option 2 which is aligned with existing requirements for HO.  On option 1, we understand it may be same as option 2, if it means the original requirements before the cell change do not apply. In our view, the measurement period should be restarted after the cell change is complete. |
| Ericsson | Support option 2. |

#### Issue 4-3-2: Measurement period requirements with cell change not impacting SRS

*The issue is about* *UE behavior and requirements when cell change that not impacts SRS transmission occurs during UE Rx-Tx measurement period.*

* Proposals
  + Option 1 (QC)
    - FFS, may depend on exact cases
  + Option 2 (OPPO)
    - UE shall continue the on-going UE Rx-Tx time difference measurement, and longer measurement period is expected.
  + Option 3a (vivo, HW, Ericsson, Nokia)
    - UE shall continue the on-going UE Rx-Tx time difference measurement and the current measurement period and accuracy apply.
      * HW: no need to capture anything in the spec for this case.
* Recommended WF
  + Further discuss

|  |  |
| --- | --- |
| **Company** | **Comments** |
| CATT | Fine with option 3a. |
| vivo | Support option 3a. |
| Nokia | Option 3a. In our view there could be an informative note in the spec for this scenario. |
| Intel | Support option 3a |
| Huawei | Support option 3 and we do not see a need to capture this in the spec since the application of the requirements is not impacted. |
| Ericsson | Support option 3a. But this should be defined/captured in the spec.  Issues 4-3-1 and 4-3-2 can be combined and defined as one place.  For example it can be captured as follows:   * If cell change during the ongoing UE Rx-Tx time difference measurement impacts the SRS configuration then the UE shall restart the UE Rx-Tx time difference measurement after the SRS reconfiguration on the target cell is complete; otherwise the UE shall continue the on-going UE Rx-Tx time difference measurement and the current measurement period and accuracy apply. |

## Companies views’ collection for 1st round

### Open issues

### CRs/TPs comments collection

*Major close to finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2104744  (CATT) | Huawei: A comment on all the CRs, we suggest to merge all the CRs, and use one to capture the technical agreements. |
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| R4-2106517  (OPPO) |  |
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| R4-2106630  (vivo) |  |
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|  |
| R4-2107002  (HW) |  |
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|  |
| R4-2107164  (Ericsson) |  |
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|  |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary** |
| **Sub-topic#1** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

*Suggestion on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| #1 |  |  |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provided recommendation on CRs/TPs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

# Recommendations for Tdocs

## 1st round

**New tdocs**

|  |  |  |
| --- | --- | --- |
| **Title** | **Source** | **Comments** |
| WF on … | YYY |  |
| LS on … | ZZZ | To: RAN\_X; Cc: RAN\_Y |
|  |  |  |

**Existing tdocs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Tdoc number** | **Title** | **Source** | **Recommendation** | **Comments** |
| R4-210xxxx | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
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Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics incl. existing and new tdocs.
2. For the Recommendation column please include one of the following:
   1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
   2. Other documents: Agreeable, Revised, Noted
3. For new LS documents, please include information on To/Cc WGs in the comments column
4. Do not include hyper-links in the documents

## 2nd round

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Tdoc number** | **Title** | **Source** | **Recommendation** | **Comments** |
| R4-210xxxx | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
| R4-210xxxx | WF on … | YYY | Agreeable, Revised, Noted |  |
| R4-210xxxx | LS on … | ZZZ | Agreeable, Revised, Noted |  |
|  |  |  |  |  |

Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics.
2. For the Recommendation column please include one of the following:
   1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
   2. Other documents: Agreeable, Revised, Noted
3. Do not include hyper-links in the documents