**3GPP TSG-RAN WG4 Meeting # 97-e R4-2017483**

**Electronic Meeting, 2 – 13 November, 2020**

**Agenda item:** 7.7.1, 7.7.2

**Source:** Moderator (Huawei, HiSilicon)

**Title:** Email discussion summary for [97e][213] NR\_pos\_RRM\_1

**Document for:** Information

# Introduction

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

7.7.1: General

7.7.2: RRM core requirements maintenance (38.133)

7.7.2.1: PRS-RSTD measurement requirements

7.7.2.2 : PRS-RSRP measurement requirements

7.7.2.3: UE Rx-Tx time difference measurement requirements

7.7.2.4: Other requirements

In providing comments, companies are encouraged to:

* Ensure that the comments are inserted in the latest version of the document by checking the folder before uploading
* Use “Track changes” to help identify added comments/changes
* Append the company name and round number before uploading

# Topic #1: RSTD measurement

## Companies’ contributions summary

*Note: Proposal 1 of R4-2016390 is to be treated in email 214. Proposal 4 of R4-2015750 is to be treated under Topic 4.*

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2014004 | ZTE Corporation | N.A. |
| [**R4-2014445**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014445.zip) | CATT | **Proposal 1: The calculation of PRS sample duration should be based on the type (type 1 or type 2) as UE used to report {N,T}.** **Proposal 2: When multiple PRS periodicities are configured, use the maximum PRS resource periodicity among all PRS resource in a same positioning frequency layer.** **Proposal 3: RSTD measurement period to be defined for cases when PRS occasions are not dropped.** **Proposal 4: RSTD measurement period is not impacted by PRS-RSRP measurement.**  |
| [**R4-2014573**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014573.zip) | Intel Corporation | ***Proposal 1: For RSTD measurement delay, the PRS sample duration shall be based on the same type (either type 1 or type 2) as UE used to report {N,T}****.****Proposal 2: Use the maximum PRS resource periodicity among all PRS resource in a same positioning frequency layer.******Proposal 3: The requirement for RSTD measurement reporting in Rel16 need not account the PRS occasion dropping due to PRS and RRM measurement happened simultaneously*.** ***Proposal 4: RSTD measurement period shall not be impacted by PRS-RSRP measurement.*** |
| [**R4-2014799**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014799.zip) | OPPO | **Proposal 1: The total measurement period for RSTD when MGs and processing time T do not have overlap between different positioning frequency layers:*** **If such scenario is considered as a rare case, then adopt option 1 *TRSTD, total* = Σ*TRSTD, i* + *X***
* **If such scenario is considered as a typical case, then adopt option 2 *TRSTD, total* = *max*(*TRSTD, i*) + *max*(*Teffect,i*)**  **to reduce the measurement delay**

**Proposal 2: When more than one PRS resource sets with different periodicities are configured in the same positioning frequency layer, the least common multiple of PRS periodicities in that frequency layer, i.e. *LCM*(TPRS1, TPRS2, …), should be used to derive the measurement period.** **Proposal 3: For the PRS dropping due to SSB collision, we can support either option 1 or option 3:*** **Option 1: RSTD measurement period to be defined for case when PRS are not dropped**
* **Option 3: The same measurement period requirement shall be met, regardless of whether some the PRS symbols are dropped or not during this measurement period**
 |
| [**R4-2015750**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015750.zip) | Huawei, HiSilicon | **Proposal 1: 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 2: Calculation of PRS sample duration L is based the type (type 1 or type 2) UE reported.****Proposal 3: SSB collision is not accounted in PRS measurement period. The PRS measurement requirements apply PRS occasions are not dropped due to collision with SSB.****Proposal 4: RSTD measurement period is not impacted by PRS-RSRP measurement.** |
| [**R4-2015751**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015751.zip) | Huawei, HiSilicon | CR based on [R4-2015750](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015750.zip) |
| [**R4-2016390**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016390.zip) | Ericsson | * **Observation 1**: The measurement period requirement in TS 38.133 is not correct (as seen from Figure 1b).

Figure 1a: CSSF=1 for a single frequency layer (L=1), Figure 1b: CSSF=2 for two frequency layers (L=2) which are sharing the same gap.**Figure 1a: CSSF=1, L=1 (** PRS on f1**).****Figure 1b: L=2 with gap sharing, CSSF=2 ( PRS on f1,  PRS on f2).*** ***Proposal 2***: *CSSF is the NR concept which is used for all types of measurements including RRM, scaling based on the number of frequency layers is the LTE concept. Hence, for the gap sharing case, CSSF shall be used in the requirements, but Σ over frequency layers shall be replaced with the max operator*:

TRSTD, Total = maxi (TRSTD,i).* ***Observation 2****: The measurement period requirement in TS 38.133 for the sharing case is not relevant (unnecessarily too long) for the non-sharing case.*

**Figure 2: L=2 without gap sharing, CSSF=1 ( PRS on f1,  PRS on f2).*** ***Proposal 3****: Measurement period for the non-sharing case shall be:*
* TRSTD, Total = maxi (TRSTD,i).
* ***Proposal 4****: When RSTD is configured together with PRS-RSRP and the required PRS-RSRP measurement period is longer than that for RSTD (configured without RSTD), then the RSTD measurement continues over the entire PRS-RSRP measurement period.*
* ***Proposal 5****: RAN4 decides among the following options for the dropped PRS (which are allowed according to RAN1):*
	+ - *Option 1: UE extends the RSTD measurement period in a specified way, based on the number of dropped PRS.*
		- *Option 2: UE is allowed to extend the RSTD measurement period (clarified in the requirements) if more than N PRS are dropped, but the exact value is not specified.*
		- *Option 3: The RSTD requirements apply, regardless of how many PRS are dropped.*
 |
| [**R4-2016391**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016391.zip) | Ericsson | CR based on [R4-2016390](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015750.zip) |
| [**R4-2016507**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016507.zip) | Qualcomm Incorporated | **Proposal 1: For the purpose of PRS sample duration, calculate** $L\_{PRS,i}$ **based on the type (type 1 or type 2) used by the UE to report {N,T}.****Proposal 2: Use the maximum PRS resource periodicity among all PRS resources within a given positioning frequency layer.****Proposal 3: RSTD measurement period to be defined for cases when PRS occasions are not dropped.****Proposal 4: PRS-RSTD measurement period is not impacted by PRS-RSRP measurement.** |
| [**R4-2016558**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016558.zip) | Qualcomm Incorporated | CR based on [R4-2016507](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015750.zip) |
| R4-2016999 | OPPO | CR to TS 38.133 on measurement period requirements for PRS RSTD, PRS-RSRP and UE Rx-Tx(section 9.9) |

## Open issues summary

### Sub-topic 1-1 Calculation of PRS sample duration Lprs

* Option 1 (CATT, Intel, HW, QC): The calculation of PRS sample duration should be based on the type (type 1 or type 2) as UE used to report {N,T}

Recommended WF: Agree on option 1.

### Sub-topic 1-2 Multiple PRS periodicities

* Option 1 (CATT, Intel, QC): Use the maximum PRS resource periodicity among all PRS resources in a single positioning frequency layer
* Option 2 (OPPO): Use the least common multiple of PRS periodicities among all PRS resources in a single positioning frequency layer

Recommended WF: Further discussion needed. Collect companies’ views.

### Sub-topic 1-3 Measurement period extension due to SSB collision

* Option 1 (CATT, Intel, HW, QC, OPPO): RSTD measurement period to be defined for cases when PRS samples are not dropped.
* Option 2 (OPPO): The same measurement period requirement shall be met, regardless of whether some the PRS symbols are dropped or not during this measurement period
* Option 3 (Ericsson): RAN4 decides among the following options for the dropped PRS (which are allowed according to RAN1):
	+ - Option a: UE extends the RSTD measurement period in a specified way, based on the number of dropped PRS.
		- Option b: UE is allowed to extend the RSTD measurement period (clarified in the requirements) if more than N PRS are dropped, but the exact value is not specified.
		- Option c: The RSTD requirements apply, regardless of how many PRS are dropped.

Recommended WF: Further discussion needed. Collect companies’ views.

### Sub-topic 1-4 Measurement period when configured with PRS-RSRP

* Option 1 (CATT, Intel, HW, QC): RSTD measurement period shall not be impacted by PRS-RSRP measurement.
* Option 2 (Ericsson): When RSTD is configured together with PRS-RSRP and the required PRS-RSRP measurement period is longer than that for RSTD (configured without RSTD), then the RSTD measurement continues over the entire PRS-RSRP measurement period

Recommended WF: Further discussion needed. Collect companies’ views.

### Sub-topic 1-5 Measurement period of multiple PRS layers – overlapping case

*Based on existing requirements in 38.133, overlapping case is the case when measurement gaps and processing time T have overlap between different positioning frequency layers.*

* Option 1 (existing requirement): Measurement period of multiple PRS layers is defined as summation of the measurement period in each frequency layer
* Option 2 (Ericsson): CSSF is the NR concept which is used for all types of measurements including RRM, scaling based on the number of frequency layers is the LTE concept. Hence, for the gap sharing case, CSSF shall be used in the requirements, but Σ over frequency layers shall be replaced with the max operator:

TRSTD, Total = maxi (TRSTD,i).

Recommended WF: Further discussion needed. Collect companies’ views.

### Sub-topic 1-6 Measurement period of multiple PRS layers – non-overlapping case

*Based on existing requirements in 38.133, non-overlapping case is the case when measurement gaps and processing time T do not have overlap between different positioning frequency layers.*

* Option 1 (OPPO): If such scenario is considered as a rare case, then adopt the sum approach; If such scenario is considered as a typical case, then adopt the max approach to reduce the measurement delay
* Option 2 (HW): Same requirements as for overlapping case (sum approach)
* Option 3 (Ericsson): Measurement period for the *non-sharing case* shall be:
* TRSTD, Total = maxi (TRSTD,i).

Recommended WF: Further discussion needed. Collect companies’ views.

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
|  | **Sub-topic 1-1 Calculation of PRS sample duration Lprs****Sub-topic 1-2 Multiple PRS periodicities****Sub-topic 1-3 Measurement period extension due to SSB collision****Sub-topic 1-4 Measurement period when configured with PRS-RSRP****Sub-topic 1-5 Measurement period of multiple PRS layers – overlapping case****Sub-topic 1-6 Measurement period of multiple PRS layers – non-overlapping case** |
| Huawei | **Sub-topic 1-1 Calculation of PRS sample duration Lprs**Support the Recommended WF**Sub-topic 1-2 Multiple PRS periodicities**We support option 2, which is more accurate. There is a difference when PRS1 is period is 8ms and PRS2 is 10ms, and MGRP is 20ms. The Tavailalbe should be 40ms but with current spec it is 20ms.**Sub-topic 1-3 Measurement period extension due to SSB collision**Support option 1.We cannot agree to option 3a as it is for corner cases (SSB and PRS collision). We can also not agree to option 2 or option 3c as it means current requirements defined assuming no PRS dropping will apply even there is PRS dropping. For option 3b, we do not see the technical benefit compared to option 1, but RAN4 needs to spend additional efforts to further discuss the value of N.**Sub-topic 1-4 Measurement period when configured with PRS-RSRP**Support option 1. We do not see clear benefit to delay RSTD reporting just for PRS-RSRP which is more like a quality indicator.**Sub-topic 1-5 Measurement period of multiple PRS layers – overlapping case**Support option 1.The current CSSF does not work for PRS measurement because processing time is not considered. For example, for the PRS configuration shown in the Figure, following the current CSSF, CSSF for both PRS layers will be 1. However, if the processing time T is >40ms, then UE cannot measure every instance of the two PRS layers, so CSSF=1 does not work. Therefore, the MG sharing between PRS layers is accounted by defining the total measurement period for multiple PRS layers as the sum of the measurement periods of individual PRS layers.**Sub-topic 1-6 Measurement period of multiple PRS layers – non-overlapping case**Support option 2.Defining split requirements for overlapping case and non-overlapping case would complicate the requirements. In particular, it is not easy to define the exact condition of non-overlapping when it comes to more than 2 PRS layers. In addition, the necessity to have separate requirements for non-overlapping case is also a bit unclear. For example, the application of the requirements depends on network configuration and UE capability, so it may not be very useful for real deployment. Also, RAN4 requirements are minimum requirements and UE is always allowed to perform better than RAN4 requirements, and as such the requirements should be defined based on worst case. |
| CATT | **Sub-topic 1-1 Calculation of PRS sample duration Lprs**Support the recommended WF. **Sub-topic 1-2 Multiple PRS periodicities**Support option 2. The issue raised in OPPO’s paper is valid. Since there is only one MG pattern can be configured in R16, all the PRS resources in the same layer should be in the same gap pattern. If maximum PRS periodicity is used, the other PRS may be not covered in MG. So the least multiple of PRS periodicities in single layer should be used to define measurement period requirements. **Sub-topic 1-3 Measurement period extension due to SSB collision**Support option 1. But we are fine to add a note like option 3b or option 3c in the spec for clarification. **Sub-topic 1-4 Measurement period when configured with PRS-RSRP**Support option 1. The PRS-RSRP measurement in this case is configured as assistance data and should not impact the primary measurement requirements. **Sub-topic 1-5 Measurement period of multiple PRS layers – overlapping case**Support option 1. CSSF is also scaling factor based on the number of frequency layers in our understanding. There is no assumption that UE can process multiple layers simultaneously when the gaps and processing time do not have overlap between layers. And we don’t think this is typical case. So the measurement period of multiple PRS layers should be defined as summation of the measurement period in each frequency layer no matter overlapping case and non-overlapping case. **Sub-topic 1-6 Measurement period of multiple PRS layers – non-overlapping case**Support option 2. See the comment in sub-topic 1-5.  |
| Ericsson | **Sub-topic 1-1 Calculation of PRS sample duration Lprs**Do not agree with the recommended WF. The sample parameters (e.g., number of repetitions, number of PRS symbols in slot, etc.) are to be defined in the accuracy requirements, no need to rediscuss the sample definition etc. It’s very clear already from how the requirements are defined that it is associated with a PRS period.**Sub-topic 1-2 Multiple PRS periodicities**More discussion is needed. What if e.g. not all PRS resources or resource sets are in gaps.**Sub-topic 1-3 Measurement period extension due to SSB collision**Option 3b or option 3c**Sub-topic 1-4 Measurement period when configured with PRS-RSRP**Option 2. Even if the minimum required measurement period is not extended for RSTD, the UE shall continue the RSTD measurement if PRS-RSRP measurement period is longer than that for RSTD.**Sub-topic 1-5 Measurement period of multiple PRS layers – overlapping case**Option 2, since the current requirement is not correct as shown below in figure 1b:Figure 1a: CSSF=1 for a single frequency layer (L=1), Figure 1b: CSSF=2 for two frequency layers (L=2) which are sharing the same gap.**Figure 1a: CSSF=1, L=1 (** PRS on f1**).****Figure 1b: L=2 with gap sharing, CSSF=2 ( PRS on f1,  PRS on f2).****Sub-topic 1-6 Measurement period of multiple PRS layers – non-overlapping case****Option 3, since using the current requirement is not correct:****Figure 2: L=2 without gap sharing, CSSF=1 ( PRS on f1,  PRS on f2).** |
| Intel | **Sub-topic 1-1 Calculation of PRS sample duration Lprs**The recommended WF can be agreed. **Sub-topic 1-2 Multiple PRS periodicities**Support Option 1. The argument for Option 2 is misalignment of different periodicity among the same positioning frequency layer. But for the measurement over the different TRPs among the same positioning frequency layer shall be coordinated by LPP server easily. E.g. in most case the different offset for same periodicity can be work properly. The LCM for this will increase the total requirements significantly which can not verify the typical cases exactly. **Sub-topic 1-3 Measurement period extension due to SSB collision**Support Option 1. The SSB collision cases was excluded from Rel16 scope already. **Sub-topic 1-4 Measurement period when configured with PRS-RSRP**Support Option 1. RSTD shall be reported independent with PRS RSRP. **Sub-topic 1-5 Measurement period of multiple PRS layers – overlapping case**Support Option 1. The argument for Option 2 (Ob1 in [R4-2016390](file:///C%3A%5CUsers%5Crhuang5%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C97e%5CDocs%5CR4-2016390.zip) ) is incorrect because in case of gap available, UE may not complete PRS processing of last PRS. UE needs to wait the PRS after that. E.g. in Fig1b, for the second PRS, UE may not handle it because of UE processing time T is larger than MGRP.**Sub-topic 1-6 Measurement period of multiple PRS layers – non-overlapping case**Support Option 1. Regarding to RAN4 requirements , the worst cases is based. No need separated requirements for non-overlapping cases  |
| Qualcomm | **Sub-topic 1-1 Calculation of PRS sample duration Lprs**Option 1: The calculation of PRS sample duration should be based on the type (type 1 or type 2) as UE used to report {N,T}**Sub-topic 1-2 Multiple PRS periodicities**OPPO raised a valid point. In general, there could be some PRS periodicities that are multiples of 5 and others that are 2^n in the same positioning frequency layer. To address such cases, one should choose the LCM of all PRS periodicities. We can support option 2 or alternatively we propose the following: in Rel-16, since PRS measurement is not mandated outside MG (TS 38.214, sec. 5.1.6.5) and MGRP are all multiples of 5 ms, RAN4 requirements should apply only for PRS periodicities that are multiples of 5 ms. i.e. effectively both options would be identical with the proposed constraint.**Sub-topic 1-3 Measurement period extension due to SSB collision**Option 1a: RSTD measurement period to be defined for cases when PRS samples are not dropped.**Sub-topic 1-4 Measurement period when configured with PRS-RSRP**Could we request confirmation that the scenario in question is UE doing TDOA only with RSRP as a secondary measurement? This would be different that the UE being configured to do both TDOA and AoD at the same time.**Sub-topic 1-5 Measurement period of multiple PRS layers – overlapping case**Option 1 (existing requirement): Measurement period of multiple PRS layers is defined as summation of the measurement period in each frequency layer**Sub-topic 1-6 Measurement period of multiple PRS layers – non-overlapping case**Option 2: Same requirements as for overlapping case (sum approach) |
| OPPO | **Sub-topic 1-1 Calculation of PRS sample duration Lprs**Support the recommended WF**Sub-topic 1-2 Multiple PRS periodicities**Support option 2. Using the least common multiple of PRS periodicities is more reasonable to cover all PRS resources.Reply to intel: In case of multiple resource with same periodicity but different time offset, using LCM will not increase total measurement delay since the effective period is same the PRS periodicity. I guess the impacts of multiple PRS with different offset are embodied in Lprs rather effective periodicity. **Sub-topic 1-3 Measurement period extension due to SSB collision**Our first preference is option 1 and we are open to discuss option 2/3c. **Sub-topic 1-4 Measurement period when configured with PRS-RSRP**Support option 1 since PRS-RSRP measurement works as assistant factor and should not impact RSTD measurement period.**Sub-topic 1-5 Measurement period of multiple PRS layers – overlapping case**Support option 1.Reply to Huawei: in our understanding, CSSF=1 is workable in your example. PRS measurement for PRS2 will skip the first 2 occasion and start at the 3rd occasion since PRS1 and PRS2 are measured sequentially, and therefore the processing time of PRS1 will not impact the PRS2 measurements and the total RSTD measurement period is T<RSTD, PRS1>+Teffect+. T<RSTD, PRS2>Reply to Ericsson: for the scenario when two overlapping PRS layers are configured, the total measurement period depends on whether CSSF is calculated by the number of PRS layers, which is also discussed in sub-topic 4-4 below. * Alt-1: If CSSF is calculated by the number of PRS layer, i.e. CSSF=2, then the total period should be the max value as Ericsson mentioned.
* Alt-2: If the CSSF is calculated by only 1 PRS layer, i.e. CSSF=1, then the two PRS layers are measured sequentially as illustrated below and the sum approach should be applied.

 Based on the discussion during the last meeting and the comments on sub-topic 4-4, I guess the majority view is Alt-2, so we support option 1 for sub-topic 1-5. We can come back to this issue after sub-topic 4-4 is solved. **Sub-topic 1-6 Measurement period of multiple PRS layers – non-overlapping case**Support option 1 and option 2. We have identified some non-overlapping cases where the max approach could be applied in our contribution. However, such cases are highly dependent on the PRS configuration and UE capability. So, we prefer to use the sum approach as overlapping cases for simplicity.  |

### CRs/TPs comments collection

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2015751 (Huawei) | CATT: for the second change, there is a typo: ‘ For RSTD, PRS-RSRP and UE Rx-Tx time difference measurements, the requirements in clauses 9.9.2, 9.9.3 and 9.9.4 do not apply for a PRS resource if ‘ |
| Ericsson: overlaps with Ericsson’s CR in R4-2016391 |
| Intel: can merged with other overlapped CRs (e.g. Ericsson’s CR on the overlapping case, Qualcomm’s CR on the introduction part). |
| R4-2016391 (Ericsson) | Huawei: please refer to our comments on sub-topic 1-5 and 1-6. [Ericsson]: The CR actually is addressing several issues, not just the measurement period. |
| CATT: * the WI code is incorrect.

 [Ericsson]: why not?* The measurement period should depend on the conclusion of issues in topic 1 above.

 [Ericsson]: The CR actually is addressing several issues, not just the measurement period. |
| Intel: for some change to correct the CR implementation issues (e.g. remove the subclause 9.9.2.4.1 9.9.2.4.2 9.9.2.4.3 9.9.2.4.4) are reasonable. But other technical issues can not be agreed.  |
| Qualcomm: The changes to the measurement period are not agreeable. |
| R4-2016558 (Qualcomm) | Huawei: technically OK, but there are some overlapping change with other CRs, and we can discuss how to merge. |
| Ericsson: overlaps with Ericsson’s CR in R4-2016391 |
| Intel: can merged with other overlapped CRs.  |
| R4-2016999 (OPPO) | Huawei: technically OK, but there are some overlapping change with other CRs, and we can discuss how to merge. |
| CATT: CR category may be incorrect.  |
| Ericsson: overlaps with Ericsson’s CR in R4-2016391 |
| OPPO: ok to discuss how to merge with other CRs. |

## 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.*

|  |  |
| --- | --- |
| **Sub-topic#1** | **Calculation of PRS sample duration Lprs***Tentative agreements:*No tentative agreement in 1st round. *Candidate options:** Option 1 (CATT, Intel, HW, QC, OPPO): The calculation of PRS sample duration should be based on the type (type 1 or type 2) as UE used to report {N,T}
* Option 2 (Ericsson): Do not agree with option 1. The sample parameters (e.g., number of repetitions, number of PRS symbols in slot, etc.) are to be defined in the accuracy requirements

*Recommendations for 2nd round:*Continue discussion in the 2nd round and the agreement will be captured in the WF.Clarify the understanding of parameter Lprs in the measurement period requirements.  |
| **Sub-topic#2** | **Multiple PRS periodicities***Tentative agreements:*No tentative agreement in 1st round. Option 3 and 4 are added based on comments.*Candidate options:** Option 1 (Intel): Use the maximum PRS resource periodicity among all PRS resources in a single positioning frequency layer
* Option 2 (OPPO, HW, CATT, QC): Use the least common multiple of PRS periodicities among all PRS resources in a single positioning frequency layer
* Option 3 (QC): In Rel-16, RAN4 requirements should apply only for PRS periodicities that are multiples of 5 ms
* Option 4 (Ericsson): FFS, consider the case where e.g. not all PRS resources or resource sets are in gaps.

*Recommendations for 2nd round:*Continue discussion in the 2nd round and the agreement will be captured in the WF. |
| **Sub-topic#3** | **Measurement period extension due to SSB collision***GTW agreements:*Existing RSTD measurement period is defined for cases when PRS samples are not dropped.UE is allowed to extend the RSTD measurement period if one or more PRS samples are dropped due to SSB collision, but the exact value is not specified.*Candidate options:**Recommendations for 2nd round:*Closed, no further discussion needed. |
| **Sub-topic#4** | **Measurement period when configured with PRS-RSRP***Tentative agreements:*No tentative agreement in 1st round. *Candidate options:** Option 1 (CATT, Intel, HW, QC, OPPO): RSTD measurement period shall not be impacted by PRS-RSRP measurement.
* Option 2 (Ericsson): When RSTD is configured together with PRS-RSRP and the required PRS-RSRP measurement period is longer than that for RSTD (configured without RSTD), then the RSTD measurement continues over the entire PRS-RSRP measurement period

*Recommendations for 2nd round:*Continue discussion in the 2nd round and the agreement will be captured in the WF. Clarify the scenario concerned for this sub-topic:* Scenario 1: UE being configured to do DL-TDOA only
* Scenario 2: UE being configured to do both DL-TDOA and DL-AoD
 |
| **Sub-topic#5** | **Measurement period of multiple PRS layers – overlapping case***GTW agreements:*The sub-topic is coupled with sub-topic 4-4, and 2 options are agreed in the GTW discussion, and they will be further down selected in the 2nd round.*Candidate options:** Option 1 (HW, Intel, QC):
	+ Measurement period of multiple PRS layers is defined as summation of the measurement period in each frequency layer
	+ CSSF is only for the MG sharing between PRS and RRM layers. Count only a single PRS layer for a gap occasion in CSSF calculation for both PRS and RRM layers.
* Option 2 (E///):
	+ CSSF is the NR concept which is used for all types of measurements including RRM, scaling based on the number of frequency layers is the LTE concept. Hence, for the gap sharing case, CSSF shall be used in the requirements, but Σ over frequency layers shall be replaced with the max operator:

TRSTD, Total = maxi (TRSTD,i).* + Number of PRS layers to be counted in CSSF calculation is the number of frequency layers for PRS-based positioning measurements

*Recommendations for 2nd round:*Continue discussion in the 2nd round and the agreement will be captured in the WF. |
| **Sub-topic#6** | **Measurement period of multiple PRS layers – non-overlapping case***Tentative agreements:*No tentative agreement in 1st round.*Candidate options:** Option 1 (OPPO): If such scenario is considered as a rare case, then adopt the sum approach; If such scenario is considered as a typical case, then adopt the max approach to reduce the measurement delay
* Option 2 (HW, CATT, Intel, QC, OPPO): Same requirements as for overlapping case (sum approach)
* Option 3 (Ericsson): Measurement period for the *non-sharing case* shall be:
* TRSTD, Total = maxi (TRSTD,i).

*Recommendations for 2nd round:*Continue discussion in the 2nd round and the agreement will be captured in the WF. |

*Recommendations 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 provides recommendation on CRs/TPs Status update*

|  |  |
| --- | --- |
| **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)

**Sub-topic 1-1 Calculation of PRS sample duration Lprs**

*Candidate options:*

* Option 1 (CATT, Intel, HW, QC, OPPO): The calculation of PRS sample duration should be based on the type (type 1 or type 2) as UE used to report {N,T}
* Option 2 (Ericsson): Do not agree with option 1. The sample parameters (e.g., number of repetitions, number of PRS symbols in slot, etc.) are to be defined in the accuracy requirements

*Recommendations for 2nd round:*

Continue discussion in the 2nd round and the agreement will be captured in the WF.

Clarify the understanding of parameter Lprs in the measurement period requirements.

|  |  |
| --- | --- |
| **Company** | **Comments**  |
| Intel | Support Option 1 |
| OPPO | Support option 1. The specific calculation method of Lprs is necessary for the determination of measurement period. Maybe we can remove the terminology “PRS sample” to avoid ambiguity with the “sample parameters” in the accuracy requirement commented by Ericsson.  |
| Ericsson | This is performance part and related to the on-going discussion on repetitions and symbols for accuracy requirements and we already had some agreements. No need to capture anything explicitly on PRS sample calculation, especially in core requirements. In addition, **the sample also depends on MG configuration.** |
| Qualcomm | Not sure we understand the reasoning behind option 2. Irrespective of the sample parameters chosen to define the accuracy requirements, in the end we’ll have a set of PRS resources with a corresponding L\_prs\_i..We favor option 1. |
| Huawei | Option 1.The parameter “Lprs” in the measurement period requirements refer to the duration where UE takes samples for one or more multiple PRS resources. The calculation of this duration is defined in clause 5.1.6.5 of 38.214, and it is based on the type (type 1 or type 2) as UE used to report {N,T}. In our view, it is a separate issue from the sample parameters for accuracy requirements.  |
| CATT | Support option 1.  |

**Sub-topic 1-2 Multiple PRS periodicities**

*Candidate options:*

* Option 1 (Intel): Use the maximum PRS resource periodicity among all PRS resources in a single positioning frequency layer
* Option 2 (OPPO, HW, CATT, QC): Use the least common multiple of PRS periodicities among all PRS resources in a single positioning frequency layer
* Option 3 (QC): In Rel-16, RAN4 requirements should apply only for PRS periodicities that are multiples of 5 ms
* Option 4 (Ericsson): FFS, consider the case where e.g. not all PRS resources or resource sets are in gaps.

*Recommendations for 2nd round:*

Continue discussion in the 2nd round and the agreement will be captured in the WF.

|  |  |
| --- | --- |
| **Company** | **Comments**  |
| Intel | We can also support Option 2.  |
| OPPO | Support option 2.There is no restriction on PRS periodicities in Rel-16 and therefore the scenario may exist when PRS resource with periodicity which is the multiple of 5ms, e.g. 10ms and PRS resource with periodicity which is not the multiple of 5ms, e.g. 8ms are configured in the same layer. Option 2 is more comprehensive than option 1 and option 3. For option 4, we do not understand why MG configuration should be considered in this issue since PRS resource may not overlap with MG even for single PRS periodicity case. |
| Ericsson | FFS. Depends also on MGRP |
| Qualcomm | We propose that option 3 should be considered in addition to options 1 and 2. The argument is as follows. The existing MG patterns in 3GPP all have MGRP that are multiples of 5 ms. Assuming PRS has to be measured within MG then it would be quite impractical to measure PRS resources with periodicities that are not multiples of 5 ms.It would take too long. If we adopt option 3, then options 1 and 2 are equivalent.Option 4 could be considered as an optimization in Rel 17. |
| Huawei | We suggest to further discuss this issue in next meeting taking into account the two new options (option 3 and option 4). |
| CATT | Support option 2.  |

**Sub-topic 1-3 Measurement period when configured with PRS-RSRP**

*Candidate options:*

* Option 1 (CATT, Intel, HW, QC, OPPO): RSTD measurement period shall not be impacted by PRS-RSRP measurement.
* Option 2 (Ericsson): When RSTD is configured together with PRS-RSRP and the required PRS-RSRP measurement period is longer than that for RSTD (configured without RSTD), then the RSTD measurement continues over the entire PRS-RSRP measurement period
* Option 3 (Ericsson): Option 1 but as long as PRS-RSRP measurement accuracy is also met (which is the current requirement).

*Recommendations for 2nd round:*

Continue discussion in the 2nd round and the agreement will be captured in the WF.

Clarify the scenario concerned for this sub-topic:

* Scenario 1: UE being configured to do DL-TDOA only
* Scenario 2: UE being configured to do both DL-TDOA and DL-AoD

|  |  |
| --- | --- |
| **Company** | **Comments**  |
| Intel | For Scenario 1, as RSRD is mandatory report for TDoA, the measurement period of RSTD shall be prioritized. For Scenario 2, in DL-AoD the reporting RSRP is independently.  |
| OPPO | Agree with intel. |
| Ericsson | As of now, the UE shall meet the requirements also for PRS-RSRP whenever PRS-RSRP is configured, the UE cannot report measurements which are not meeting the requirements. With Option 1, even in scenario 1, the PRS-RSRP accuracy requirements may not be met, so then PRS-RSRP shall not be reported for DL-OTDOA. Compromise: Option 3From 38.133:10.1.24 PRS-RSRP Measurements10.1.24.1 IntroductionThe requirements in Clause 10.1.24 shall apply, provided the UE has received *nr-DL-TDOA-RequestLocationInformation* or *nr-Multi-RTT-RequestLocationInformation* or *nr-DL-AoD-RequestLocationInformation* message from LMF via LPP [31] requesting the UE to report one or more DL PRS-RSRP measurements defined in TS 38.215 [4]. |
| Qualcomm | We asked for clarification regarding the scenario considered in this sub-topic.Scenario 1: UE being configured to do DL-TDOA onlyOur understanding is that, in this case, the UE receives *NR-DL-TDOA-ProvideAssistanceData* with *nr-SelectedDL-PRS-IndexList* specifying which PRS resources are selected/applicable for this *NR-DL-TDOA-ProvideAssistanceData* message. If the UE supports PRS-RSRP measurement for DL-TDOA, indicated via *supportOfDL-PRS-RSRP-MeasFR1* or *supportOfDL-PRS-RSRP-MeasFR2* in *NR-DL-TDOA-MeasurementCapability*, then the UE reports PRS-RSRP results for each measured PRS resource in *NR-DL-TDOA-SignalMeasurementInformation*. Since the set of PRS resources for TDOA and RSRP is one and the same, if the number of PRS samples measured per resource is the same for both RSTD and RSRP (which companies seem to agree upon), then the measurement period should be the same for both RSTD and RSRP. Therefore option 2 above does not apply in this case. Scenario 2: UE being configured to do both DL-TDOA and DL-AoDIn this case the UE receives both *NR-DL-TDOA-ProvideAssistanceData* and *NR-DL-AoD-ProvideAssistanceData*, each of them with potentially different *nr-DL-PRS-AssistanceData* and/or *nr-SelectedDL-PRS-IndexList*. In this case the measurement period could be totally different for RSTD and RSRP (associated with DL-AoD) since they could be measuring different PRS resources. Note that, if the UE supports PRS-RSRP measurement for DL-TDOA as mentioned above, two different sets of PRS-RSRP results would be reported for DL-TDOA and DL-AoD, respectively. For the DL-TDOA RSRP results, we’re back to scenario 1 and the same conclusion would apply. If the UE does not support PRS-RSRP measurement for DL-TDOA, then RSRP results would be reported for DL-AoD only and the measurement period could be different from DL-TDOA. However, it would seem odd to refer to this last case as “RSTD configured with RSRP.”Conclusion: For scenario 1, the measurement periods for RSTD and RSRP would be the same, assuming N\_samples is the same for both. There is no need to consider option 1 vs. option 2 for scenario 1. In scenario 2, the UE would be performing measurements for two different positioning methods. The measurement periods for RSTD (DL-TDOA) and RSRP (for DL-AoD) could be completely different depending on the assistance data configured for each of them. In our view, scenario 2 is outside the scope of this sub-topic, i.e. “RSTD configured with RSRP.” |
| Huawei | Share similar view as QC.For scenario 1, the measurement period or RSTD and PRS-RSRP would be same as they are measured from the same set of resources.For scenario 2, the measurement period or RSTD and PRS-RSRP (for DL-AoD) would be independent, and could be different depending on PRS configurations for each measurement.  |
| CATT | Option 1 or scenario 1, for scenario 2, need further check the reporting principle when configured both DL-TDOA and DL-AoD.  |

**Sub-topic 1-5 Measurement period of multiple PRS layers – overlapping case**

*Candidate options:*

* Option 1 (HW, Intel, QC):
	+ Measurement period of multiple PRS layers is defined as summation of the measurement period in each frequency layer
	+ CSSF is only for the MG sharing between PRS and RRM layers. Count only a single PRS layer for a gap occasion in CSSF calculation for both PRS and RRM layers.
* Option 2 (E///):
	+ CSSF is the NR concept which is used for all types of measurements including RRM, scaling based on the number of frequency layers is the LTE concept. Hence, for the gap sharing case, CSSF shall be used in the requirements, but Σ over frequency layers shall be replaced with the max operator:

TRSTD, Total = maxi (TRSTD,i).

* + Number of PRS layers to be counted in CSSF calculation is the number of frequency layers for PRS-based positioning measurements

*Recommendations for 2nd round:*

Continue discussion in the 2nd round and the agreement will be captured in the WF.

The sub-topic is coupled with sub-topic 4-4, and 2 options are agreed in the GTW discussion, and they will be further down selected in the 2nd round.

|  |  |
| --- | --- |
| **Company** | **Comments**  |
| Intel | Support Option 1 |
| OPPO | Support option 1.Firstly, when multiple PRS layers with long periodicity are configured, sum approach should be used. As shown in figure below, when PRS layer 1 and PRS layer 2 are total overlapped with 320ms periodicity, CSSF=1 is applied for each layer based on the agreements achieved in the last meeting and max approach is not workable. We do not expect to use separate method for long periodicity and short periodicity scenarios. Secondly, it is not clear how to handle the case when processing capability is exceeded if option 2 is used. We cannot support option 2 before any specific solution is present. |
| Ericsson | Option 2. Option 1 is broken.For Rel-15 RRM, CSSF is used without restricting on the order in which the measurements are made and this works. This also works for PRS-RSRP since the measurement period starts from the first available MG, **therefore CSSF=2 for this case and Tf2 spans over 8 occasions (not 4 claimed by some companies). Therefore the current RAN4 requirement (Tf2+Tf1) is wrong.** |
| Qualcomm | Although far from perfect, we favor option 1 for its relative simplicity/tractability and generality. Option 2 perhaps could work but it seems more opaque, less tractable, and it is not entirely clear how much better (tighter) it would be, in general. |
| Huawei | Support Option 1.Option 2 as it is can only work for the case where processing time does not exceed the resources periodicity, so RAN4 still has to discuss what happens otherwise. On the other hand the gain from option 2 over option 1 is unclear. |
| CATT | Support option 1.  |

**Sub-topic 1-6 Measurement period of multiple PRS layers – non-overlapping case**

*Candidate options:*

* Option 1 (OPPO): If such scenario is considered as a rare case, then adopt the sum approach; If such scenario is considered as a typical case, then adopt the max approach to reduce the measurement delay
* Option 2 (HW, CATT, Intel, QC, OPPO): Same requirements as for overlapping case (sum approach)
* Option 3 (Ericsson): Measurement period for the *non-sharing case* shall be:
* TRSTD, Total = maxi (TRSTD,i).

*Recommendations for 2nd round:*

Continue discussion in the 2nd round and the agreement will be captured in the WF.

|  |  |
| --- | --- |
| **Company** | **Comments**  |
| Intel | Support Option 2 |
| Ericsson | Option 3. If the overlapping case requirement is changed to max(): Option 2 and Option 3 are the same.If the overlapping case requirement is not changed to max(): It’s very clear that Option 2 is unnecessary overestimation (the measurement period is longer than needed by a factor of the number of frequency layers). Furthermore, the non-overlapping case is actually even more common than overlapping:* PRS are typically misaligned among frequency layers (this is even an explicit a requirement in LTE)
* It is always non-overlapping when *durationOfPRS-ProcessingSymbolsInEveryTms* ≤max(MGRP,TPRS)
* durationOfPRS-ProcessingSymbolsInEveryTms={8,16,20,30,40,80,160,320,640,1280} ms
* TPRS =4…10240 ms
 |
| Qualcomm | Our vote is for option 2 for the reasons stated in sub-topic 1-5. |
| Huawei | Support Option 2. Same reason as in the 1st round. |
| CATT | Support option 2.  |

## 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**  |
| R4-2017143 | WF on UE PRS measurement requirements*No further agreement in 2nd round. Open issues and possible options are captured in the WF* |

# Topic #2: PRS-RSRP measurement

## Companies’ contributions summary

*Note: R4-2014006 is to be treated in email 214. Proposal 1~3 of R4-2016392 is to be treated in email 214. R4-2014575 is to be treated under Topic 3.*

*Note: For some sub-topics, proposals from companies are same as those for RSTD in Topic 1. For these sub-topics, moderator suggests to avoid duplicating the discussions and follow the same conclusions for RSTD.*

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2015369**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015369.zip) | CATT | CR R4-2009129 was agreed in RAN4#95e meeting but not implemented in 38.133. This CR re-introduces PRS-RSRP measurement report mapping in 38.133 |
| [**R4-2015752**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015752.zip) | Huawei, HiSilicon | **Proposal 1: 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 2: PRS-RSRP measurement period is defined based on Number of PRS samples** $N\_{sample}$ **= 4.****Proposal 3: Same measurement reporting requirements apply for all kinds of positioning measurement reporting.** |
| [**R4-2015753**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015753.zip) | Huawei, HiSilicon | CR based on R4-2015753 |
| [**R4-2016392**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016392.zip) | Ericsson | * ***Observation 2****: The measurement period requirement in TS 38.133 is not correct (as seen from Figure 1b).*

Figure 1a: CSSF=1 for a single frequency layer (L=1), Figure 1b: CSSF=2 for two frequency layers (L=2) which are sharing the same gap.**Figure 1a: CSSF=1, L=1 (** PRS on f1**).****Figure 1b: L=2 with gap sharing, CSSF=2 ( PRS on f1,  PRS on f2).*** ***Proposal 4***: *CSSF is the NR concept which is used for all types of measurements including RRM, scaling based on the number of frequency layers is the LTE concept. Hence, for the gap sharing case, CSSF shall be used in the requirements, but Σ over frequency layers shall be replaced with the max operator*:

TPRS-RSRP, Total = maxi (TPRS-RSRP,i).* **Observation 3**: The measurement period requirement in TS 38.133 for the sharing case is not relevant (unnecessarily too long) for the non-sharing case.

**Figure 2: L=2 without gap sharing, CSSF=1 ( PRS on f1,  PRS on f2).*** ***Proposal 5****: Measurement period for the non-sharing case shall be:*

TPRS-RSRP, Total = maxi (TPRS-RSRP,i).* ***Proposal 6****: 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.*
* ***Proposal 7****: RAN4 decides among the following options for the dropped PRS (which are allowed according to RAN1):*
	+ - *Option 1: UE extends the PRS-RSRP measurement period in a specified way, based on the number of dropped PRS.*
		- *Option 2: UE is allowed to extend the PRS-RSRP measurement period (clarified in the requirements) if more than N PRS are dropped, but the exact value is not specified.*
		- *Option 3: The PRS-RSRP requirements apply, regardless of how many PRS are dropped.*
 |
| [**R4-2016393**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016393.zip) | Ericsson | CR based on R4-2016392 |
| [**R4-2016557**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016557.zip) | Qualcomm Incorporated | CR clarifying some aspects of the PRS-RSRP measurement period definition.1. Clarify that the measurement period calculation should be done according to the type of PRS processing capability reported by the UE.2. Clarify the the measurement period calculation should be based on the maximum PRS periodicity in each positioning frequency layer.3. Define the starting point of the PRS-RSRP measurement period. |

## Open issues summary

### Sub-topic 2-1 Measurement period extension due to SSB collision

* Option 1 (Moderator): Follow the same conclusion as RSTD in sub-topic 1-3

Recommended WF: Agree on option 1.

### Sub-topic 2-2 Measurement period of PRS-RSRP

* Option 1 (HW): PRS-RSRP measurement period is defined based on Number of PRS samples Nsample = 4, which is same as RSTD and UE Rx-Tx time difference.
* Option 2 (Ericsson): 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 discussion needed. Collect companies’ views.

### Sub-topic 2-3 Measurement period of multiple PRS layers – overlapping case

* Option 1 (Moderator): Follow the same conclusion as RSTD in sub-topic 1-5

Recommended WF: Agree on option 1.

### Sub-topic 2-4 Measurement period of multiple PRS layers – non-overlapping case

* Option 1 (Moderator): Follow the same conclusion as RSTD in sub-topic 1-6

Recommended WF: Agree on option 1.

### Sub-topic 2-5 Measurement reporting requirements for non-periodic reporting

* Option 1 (HW): Same measurement reporting requirements apply for all kinds of positioning measurement reporting (periodic and non-periodic).

Recommended WF: Further discussion needed. Collect companies’ views.

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
|  | **Sub-topic 2-1 Measurement period extension due to SSB collision****Sub-topic 2-2 Measurement period of PRS-RSRP****Sub-topic 2-3 Measurement period of multiple PRS layers – overlapping case****Sub-topic 2-4 Measurement period of multiple PRS layers – non-overlapping case****Sub-topic 2-5 Measurement reporting requirements for non-periodic reporting** |
| Huawei | **Sub-topic 2-1 Measurement period extension due to SSB collision**Support the Recommended WF**Sub-topic 2-2 Measurement period of PRS-RSRP**Support option 1. When RSTD or UE Rx-Tx is measured together with PRS-RSRP, all the measurements will be reported together with a single message. If we follow option 2, it means reporting of RSTD or UE Rx-Tx will be delayed due to PRS-RSRP measurement. In addition, based on our simulation results, measurement period for PRS-RSRP can be defined same as that for RSTD or UE Rx-Tx.**Sub-topic 2-3 Measurement period of multiple PRS layers – overlapping case**Support the Recommended WF**Sub-topic 2-4 Measurement period of multiple PRS layers – non-overlapping case**Support the Recommended WF**Sub-topic 2-5 Measurement reporting requirements for non-periodic reporting**Support option 1, which is straightforward. |
| CATT | **Sub-topic 2-1 Measurement period extension due to SSB collision**Support the recommended WF. **Sub-topic 2-2 Measurement period of PRS-RSRP**Support option 1. The UE behavior in option 2 should be implementation dependent. **Sub-topic 2-3 Measurement period of multiple PRS layers – overlapping case**Support the recommended WF. **Sub-topic 2-4 Measurement period of multiple PRS layers – non-overlapping case**Support the recommended WF. **Sub-topic 2-5 Measurement reporting requirements for non-periodic reporting**The measurement delay requirements in aperiodic report can be same for all kinds of positioning reporting. The accuracy requirement in one report should refer to each kind of positioning measurement respectively.  |
| Ericsson | **Sub-topic 2-1 Measurement period extension due to SSB collision**Same as for RSTD**Sub-topic 2-2 Measurement period of PRS-RSRP**Option 2 is about UE behavior not the number of samples – the UE needs to continue the measurement until the RSTD/UE Rx-Tx is finished, even if it has already met the requirement.**Sub-topic 2-3 Measurement period of multiple PRS layers – overlapping case**Same as for RSTD**Sub-topic 2-4 Measurement period of multiple PRS layers – non-overlapping case**Same as for RSTD**Sub-topic 2-5 Measurement reporting requirements for non-periodic reporting** |
| Intel | **Sub-topic 2-1 Measurement period extension due to SSB collision**The recommended WF can be agreed. **Sub-topic 2-2 Measurement period of PRS-RSRP**Support Option 1. **Sub-topic 2-3 Measurement period of multiple PRS layers – overlapping case**The recommended WF can be agreed. **Sub-topic 2-4 Measurement period of multiple PRS layers – non-overlapping case**The recommended WF can be agreed. **Sub-topic 2-5 Measurement reporting requirements for non-periodic reporting**From the reporting delay requirements themselves, support Option 1. For PRS measurement reporting, the non-periodic reporting means the one report requested by LPP.  |
| Qualcomm | **Sub-topic 2-1 Measurement period extension due to SSB collision**Option 1: Follow the same conclusion as RSTD in sub-topic 1-3**Sub-topic 2-2 Measurement period of PRS-RSRP**Option 1: PRS-RSRP measurement period is defined based on Number of PRS samples Nsample = 4, which is same as RSTD and UE Rx-Tx time difference.**Sub-topic 2-3 Measurement period of multiple PRS layers – overlapping case**Option 1: Follow the same conclusion as RSTD in sub-topic 1-5**Sub-topic 2-4 Measurement period of multiple PRS layers – non-overlapping case**Option 1: Follow the same conclusion as RSTD in sub-topic 1-6**Sub-topic 2-5 Measurement reporting requirements for non-periodic reporting**Option 1: Same measurement reporting requirements apply for all kinds of positioning measurement reporting (periodic and non-periodic). |
| OPPO | **Sub-topic 2-2 Measurement period of PRS-RSRP**Support option 1.**Sub-topic 2-5 Measurement reporting requirements for non-periodic reporting**Support option 1.**For sub-topic 2-1, 2-3, 2-4:**Support the recommended WF. |

### CRs/TPs comments collection

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2015753 (Huawei) | Ericsson: overlaps with Ericsson’s CR in R4-2016393 |
| Intel: suggest to merged with other companies CR to avoid overlapping contents  |
| Qualcomm: Noticed that N\_sample value remains in brackets even though it is addressed in your proposal 2. |
|  |
| R4-2016393 (Ericsson) | Huawei: Need to wait for conclusion for sub-topic 2-4 and 2-5 [Ericsson]: The CR actually is addressing several issues, not just the measurement period. |
| CATT: * the WI code is incorrect.

[Ericsson] Why not?* The measurement period should depend on the conclusion of issues in topic 1 above.

[Ericsson] The CR contains also other proposals, not only for the measurement period |
| Intel: can’t be agree before the technical issues are resolved. (e.g. the last two paragraphs) |
| Qualcomm: The changes to the measurement period are not agreeable. |
| R4-2016557 (Qualcomm) | Huawei: technically OK, but there are some overlapping change with other CRs, and we can discuss how to merge. |
| CATT: the measurement period for multiple PRS periodicities should follow the conclusion of RSTD measurement discussed in sub-topic 1-2 |
| Ericsson: overlaps with Ericsson’s CR in R4-2016393 |
| R4-2015369 (CATT) | Huawei: OK. |
|  |
|  |

## 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.*

|  |  |
| --- | --- |
| **Sub-topic#1** | **Measurement period extension due to SSB collision***Tentative agreements:*Follow the same conclusion for RSTD (in sub-topic 1-3). *Candidate options:**Recommendations for 2nd round:*Closed, no further discussion needed. |
| **Sub-topic#2** | **Measurement period of PRS-RSRP***Tentative agreements:*No tentative agreement in 1st round. In the comments, all companies are fine to defined PRS-RSRP measurement period based on Nsample = 4 as in option 1, and proponent of option 2 clarified that the issue is about the UE behavior when measurement period are different. Therefore, option 1 is removed.*Candidate options:** Option 2 (Ericsson): 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

*Recommendations for 2nd round:*Continue discussion in the 2nd round and the agreement will be captured in the WF.Clarify the scenario when PRS-RSRP measurement period is longer or shorter than RSTD/UE Rx-Tx, and discuss if the UE behaviour in option 2 can be agreed. * Scenario 1: UE being configured to do DL-TDOA (or multi-RTT) only
* Scenario 2: UE being configured to do both DL-TDOA (or multi-RTT) and DL-AoD
 |
| **Sub-topic#3** | **Measurement period of multiple PRS layers – overlapping case***Tentative agreements:*Follow the same conclusion for RSTD (in sub-topic 1-5). *Candidate options:**Recommendations for 2nd round:*Closed, no further discussion needed. |
| **Sub-topic#4** | **Measurement period of multiple PRS layers – non-overlapping case***Tentative agreements:*Follow the same conclusion for RSTD (in sub-topic 1-6). *Candidate options:**Recommendations for 2nd round:*Closed, no further discussion needed. |
| **Sub-topic#5** | **Measurement reporting requirements for non-periodic reporting***Tentative agreements:*Based on the comments, it seems that the current requirements in clause 9.9.3.4, which refer to the correct clause for report mapping, can be applicable for both periodic and non-periodic reporting, therefore, the following tentative agreement is suggested.Remove the following editor note in clause 9.9.3.4. *Editor’s note: the measurement reporting requirements for aperiodic reports are FFS.* *Candidate options:**Recommendations for 2nd round:*Closed, no further discussion needed. |

*Recommendations 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 provides recommendation on CRs/TPs Status update*

|  |  |
| --- | --- |
| **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)

**Sub-topic 2-2 Measurement period of PRS-RSRP**

*Candidate options:*

* Option 2 (Ericsson): 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

*Recommendations for 2nd round:*

Continue discussion in the 2nd round and the agreement will be captured in the WF.

In the 1st round comments, all companies are fine to defined PRS-RSRP measurement period based on Nsample = 4. Taking this into account, clarify the scenario when PRS-RSRP measurement period is longer or shorter than RSTD/UE Rx-Tx, and discuss if the UE behaviour in option 2 can be agreed.

* Scenario 1: UE being configured to do DL-TDOA (or multi-RTT) only
* Scenario 2: UE being configured to do both DL-TDOA (or multi-RTT) and DL-AoD

|  |  |
| --- | --- |
| **Company** | **Comments**  |
| Intel | Same comments as for Sub-topic 1-3 |
| Ericsson | Same comment as under RSTD topic. |
| Qualcomm | See our comments for sub-topic 1-4. Suggest we follow the same conclusion. |
| Huawei | Same comment as for sub-topic 1-4. |
| CATT | The scenario when measurement period of PRS-RSRP is different from RSTD/UE Rx-Tx is not clear by now. |

## 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**  |
| R4-2017143 | WF on UE PRS measurement requirements*Sub-topic 2-2, all companies suggested the issue can be handled in the same way as RSTD sub-topic 1-4.* *Further agreement in 2nd round is captured in the WF:** Measurement period of PRS-RSRP when configured with RSTD or UE Rx-Tx
	+ Follow the same conclusion for RSTD
 |

# Topic #3: UE Rx-Tx time difference measurement

## Companies’ contributions summary

*Note: Proposal 2 of R4-2014003 is to be treated in email 214. Proposal 1 of R4-2016394 is to be treated in email 214. Proposal 3 of R4-2015754 is to be treated under Topic 4.*

*Note: For some sub-topics, proposals from companies are same as those for RSTD in Topic 1 or for PRS-RSRP in Topic 2. For these sub-topics, moderator suggests to avoid duplicating the discussions and follow the same conclusions for RSTD or PRS-RSRP.*

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2014003**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014003.zip) | ZTE Corporation | **Proposal 1: 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 [-50, 50] msec of at least one DL PRS resource of each of the TRPs in the assistance data.** |
| [**R4-2014446**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014446.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 to clarify in the requirements that the measurement period can be longer if some (or more than X) SRS are dropped.** **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: No need to clarify UE Rx-Tx measurement requirements in case of NTA\_offset change** |
| [**R4-2015754**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015754.zip) | Huawei, HiSilicon | **Proposal 1: 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 2: Same measurement reporting requirements apply for all kinds of positioning measurement reporting.****Proposal 4: SRS periodicity or SRS dropping is not accounted in UE Rx-Tx time difference measurement period.****Proposal 5: The measurement requirements for UE Rx-Tx timing difference is applicable provided that any SRS transmission is within [-160, +160]ms of at least one DL PRS resource of each TRP.****Proposal 6: RAN4 to define Rx-Tx time difference requirements only for the case where SRS resource is in the same band as PRS resource.****Proposal 7: UE should continue Rx-Tx time difference measurement, even the timing of its UL transmissions changes during the measurement period.****Proposal 8: RAN4 not to capture applicability of UE Rx-Tx time difference requirements in case of NTA\_offset change.** |
| [**R4-2015755**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015755.zip) | Huawei, HiSilicon | CR based on R4-2015754 |
| [**R4-2016394**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016394.zip) | Ericsson | * ***Observation 1****: The measurement period requirement in TS 38.133 is not correct (as seen from Figure 1b).*

Figure 1a: CSSF=1 for a single frequency layer (L=1), Figure 1b: CSSF=2 for two frequency layers (L=2) which are sharing the same gap.**Figure 1a: CSSF=1, L=1.****Figure 1b: L=2 with gap sharing, CSSF=2.*** ***Proposal 2***: *CSSF is the NR concept which is used for all types of measurements including RRM, scaling based on the number of frequency layers is the LTE concept. Hence, for the gap sharing case, CSSF shall be used in the requirements, but Σ over frequency layers shall be replaced with the max operator*:

$T\_{UERxTx, Total}=max\_{i}⁡(T\_{UERxTx,i})$.* ***Observation 2****: The measurement period requirement in TS 38.133 for the sharing case is not relevant (unnecessarily too long) for the non-sharing case.*

**Figure 2: L=2 without gap sharing, CSSF=1.*** ***Proposal 3****: Measurement period for the non-sharing case shall be:*

$T\_{UERxTx, Total}=max\_{i}⁡(T\_{UERxTx,i})$.* ***Proposal 4****: 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.*
* ***Proposal 5****: RAN4 decides among the following options for the dropped PRS (which are allowed according to RAN1):*
	+ - *Option 1: UE extends the UE Rx-Tx measurement period in a specified way, based on the number of dropped PRS.*
		- *Option 2: UE is allowed to extend the UE Rx-Tx measurement period (clarified in the requirements) if more than N PRS are dropped, but the exact value is not specified.*
		- *Option 3: The UE Rx-Tx requirements apply, regardless of how many PRS are dropped.*
* ***Proposal 6****: RAN4 decides among the following options for the dropped SRS:*
	+ - *Option 1: UE extends the UE Rx-Tx measurement period in a specified way, based on the number of dropped SRS.*
		- *Option 2: UE is allowed to extend the UE Rx-Tx measurement period (clarified in the requirements), but the exact value is not specified.*
		- *Option 3: The UE Rx-Tx requirements apply, regardless of how many SRS are dropped.*
* ***Observation 3****: SRS and PRS are configured by different network nodes (serving cell and LMF/neighbor cells, respectively).*
* ***Observation 4****: The SRS is always transmitted to the serving cell while PRS may have to be received from non-collocated neighbor cells.*
* ***Observation 5****: 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 7****: UE Rx-Tx measurement period also depends SRS periodicity, e.g.:*
	+ $T\_{UERxTx,Total}$ *can be extended if the SRS periodicity is longer than max(*$T\_{PRS,i}$*)*
* ***Proposal 8:*** *The requirements for UE Rx-Tx apply regardless of the time separation between SRS and PRS (LTE approach).*
* ***Proposal 9****: 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 6****: Neighbor cells are not aware of network-configured TA. Neither serving cell nor neighbor cell is aware of autonomous timing adjustments.*
* ***Observation 7****: 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 10****: 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 11****: The UE Rx-Tx time difference measurement is restarted if the serving cell (PCell, PSCell, or SCell) configured with the SRS for positioning changes during the measurement period. 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, the UE shall continue the on-going UE Rx-Tx time difference measurement after the serving cell change.*
 |
| [**R4-2016395**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016395.zip) | Ericsson | CR based on R4-2016394 |
| [**R4-2016508**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016508.zip) | Qualcomm Incorporated | **Proposal 1: Given that proximity between SRS transmission and PRS reception is desirable for measurement accuracy, it should not be necessary to account for SRS periodicity in the UE Rx-Tx measurement period formulation.****Proposal 2: The UE Rx-Tx time difference measurement period requirement should not account for SRS dropping.****Proposal 3: The measurement requirements are 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 is independent of PRS and SRS separation.****Proposal 4: In proposal 3, we suggest X = 25.****Proposal 5: 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 layers.****Proposal 6: UE Rx-Tx time difference measurement requirements are not applicable if TA change is received during the measurement period.****Proposal 7: UE Rx-Tx time difference measurement requirements are applicable for UE autonomous adjustment of UL timing.****Proposal 8: No need to clarify UE Rx-Tx measurement requirements in case of NTA\_offset change.** |
| [**R4-2016559**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016559.zip) | Qualcomm Incorporated | CR based on R4-2016508 |
| [**R4-2014575**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014575.zip) | Intel Corporation | ***Proposal 1: UE Rx-Tx measurement delay depends on PRS periodicity, which can be same as that of PRS RSTD [2].******Proposal 2: It needs NOT to take SRS dropping count into UE Rx-Tx measurement delay requirements.******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*** |

## Open issues summary

### Sub-topic 3-1 Measurement period extension due to SSB collision

* Option 1 (Moderator): Follow the same conclusion as RSTD in sub-topic 1-1

Recommended WF: Agree on option 1.

### Sub-topic 3-2 Measurement period when configured with PRS-RSRP

* Option 1 (Moderator): Follow the same conclusion as RSTD in sub-topic 1-4

Recommended WF: Agree on option 1.

### Sub-topic 3-3 Measurement period of multiple PRS layers – overlapping case

* Option 1 (Moderator): Follow the same conclusion as RSTD in sub-topic 1-5

Recommended WF: Agree on option 1.

### Sub-topic 3-4 Measurement period of multiple PRS layers – non-overlapping case

* Option 1 (Moderator): Follow the same conclusion as RSTD in sub-topic 1-6

Recommended WF: Agree on option 1.

### Sub-topic 3-5 Measurement reporting requirements for non-periodic reporting

* Option 1 (Moderator): Follow the same conclusion as RSTD in sub-topic 2-5

Recommended WF: Agree on option 1.

### Sub-topic 3-6 SRS/PRS proximity

* Option 1 (ZTE, CATT, HW, QC, Intel): The measurement requirements are 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 is independent of PRS and SRS separation.
	+ Option 1a (ZTE): X=50ms
	+ Option 1b (CATT, HW, Intel): X=160ms
	+ Option 1c (QC): X=25ms
* Option 2 (Ericsson): The requirements for UE Rx-Tx apply regardless of the time separation between SRS and PRS (LTE approach)

Option 3 (compromise proposal from Ericsson): The requirements for UE Rx-Tx apply provided MIN(Tsrs, Tprs) ≤ 2\*X; X = FFS (we can accept X = 160 ms).

Recommended WF: Further discussion needed. Collect companies’ views.

### Sub-topic 3-7 Whether SRS periodicity should be accounted in measurement period

* Option 1 (CATT, HW, QC, Intel): No
* Option 2 (Ericsson): Yes, $T\_{UERxTx,Total}$ can be extended if the SRS periodicity is longer than max($T\_{PRS,i}$)

Recommended WF: Further discussion needed. Collect companies’ views.

### Sub-topic 3-8 Whether SRS dropping should be accounted in measurement period

* Option 1 (CATT, HW, QC, Intel): No
* Option 2 (CATT): UE is allowed to extend the UE Rx-Tx measurement period (clarified in the requirements) if some (or more than X) SRS are dropped, but the exact value is not specified
* Option 3 (Ericsson): RAN4 decides among the following options for the dropped SRS:
	+ Option a: UE extends the UE Rx-Tx measurement period in a specified way, based on the number of dropped SRS.
	+ Option b (same as option 2): UE is allowed to extend the UE Rx-Tx measurement period (clarified in the requirements), but the exact value is not specified.
	+ Option c: The UE Rx-Tx requirements apply, regardless of how many SRS are dropped.

Recommended WF: Further discussion needed. Collect companies’ views.

### Sub-topic 3-9 SRS/PRS being in same band

* Option 1 (HW, Intel): RAN4 to define Rx-Tx time difference requirements only for the case where SRS resource is in the same band as PRS resource
* Option 2 (QC): 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 layers

Recommended WF: Further discussion needed. Collect companies’ views.

### Sub-topic 3-10 Measurement period in case of UL timing change: TA command

*Note: it is agreed in RAN4#95-e R4-2008664 that UE Rx-Tx time difference accuracy requirements do not apply under TA change during the measurement period.*

* Option 1 (HW, Intel): UE should continue Rx-Tx time difference measurement (existing requirements are applicable)
* Option 2a (Ericsson): 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
* Option 2b (QC): UE Rx-Tx time difference measurement requirements are not applicable if TA change is received during the measurement period.

Recommended WF: Further discussion needed. Collect companies’ views.

### Sub-topic 3-11 Measurement period in case of UL timing change: UE autonomous adjustment

* Option 1 (HW, Intel, QC): UE should continue Rx-Tx time difference measurement (existing requirements are applicable)
* Option 2 (Ericsson): 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

Recommended WF: Further discussion needed. Collect companies’ views.

### Sub-topic 3-12 Measurement period in case of UL timing change: *NTA\_offset* change

* Option 1 (CATT, HW, QC): No need to clarify UE Rx-Tx measurement requirements in case of NTA\_offset change
* Option 2 (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 discussion needed. Collect companies’ views.

### Sub-topic 3-13 UE Rx-Tx at cell change

Proposals

* **Option 1** (Ericsson): The UE Rx-Tx time difference measurement is restarted if the serving cell (PCell, PSCell, or SCell) configured with the SRS for positioning changes during the measurement period. 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, the UE shall continue the on-going UE Rx-Tx time difference measurement after the serving cell change.

Recommended WF: Agree on option 1

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
|  | **Sub-topic 3-1 Measurement period extension due to SSB collision****Sub-topic 3-2 Measurement period when configured with PRS-RSRP****Sub-topic 3-3 Measurement period of multiple PRS layers – overlapping case****Sub-topic 3-4 Measurement period of multiple PRS layers – non-overlapping case****Sub-topic 3-5 Measurement reporting requirements for non-periodic reporting****Sub-topic 3-6 SRS/PRS proximity****Sub-topic 3-7 Whether SRS periodicity should be accounted in measurement period****Sub-topic 3-8 Whether SRS dropping should be accounted in measurement period****Sub-topic 3-9 SRS/PRS being in same band****Sub-topic 3-10 Measurement period in case of UL timing change: TA command****Sub-topic 3-11 Measurement period in case of UL timing change: UE autonomous adjustment****Sub-topic 3-12 Measurement period in case of UL timing change: *NTA\_offset* change****Sub-topic 3-13 UE Rx-Tx at cell change** |
| ZTE | **Sub-topic 3-6 SRS/PRS proximity**Support Option 1a. A first step would be to try to converge to Option 1 and then to discuss a specific value. We prefer X = 50 ms. |
| Huawei | **Sub-topic 3-1 Measurement period extension due to SSB collision**Support the Recommended WF**Sub-topic 3-2 Measurement period when configured with PRS-RSRP**Support the Recommended WF**Sub-topic 3-3 Measurement period of multiple PRS layers – overlapping case**Support the Recommended WF**Sub-topic 3-4 Measurement period of multiple PRS layers – non-overlapping case**Support the Recommended WF**Sub-topic 3-5 Measurement reporting requirements for non-periodic reporting**Support the Recommended WF**Sub-topic 3-6 SRS/PRS proximity**Support option 1b, which represents a reasonable tradeoff between performance of multi-RTT positioning and NW restriction.**Sub-topic 3-7 Whether SRS periodicity should be accounted in measurement period**Support option 1. Based on 38.215, the Tx timing in UE Rx-Tx measurement is not based on SRS. The overall performance of multi-RTT positioning can be addressed by SRS/PRS proximity in sub-topic 3-6.**Sub-topic 3-8 Whether SRS dropping should be accounted in measurement period**Support option 1. Similar as sub-topic 1-3, we suggest that the UE Rx-Tx measurement requirements apply only for the case when no SRS is dropped.**Sub-topic 3-9 SRS/PRS being in same band**Support option 1, which is addressing the typical use case. **Sub-topic 3-10 Measurement period in case of UL timing change: TA command**Support option 1.Technically, as gNB of neighbour cell is not aware of TA change of the UE, there is anyway a possibility that gNB Rx-Tx is based on a different UL timing as UE Rx-Tx, so option 2a or 2b does not provide clear benefit. On the other hand, UE TA change may happen frequently. If there is no requirement for this case or measurement period restarts, the UE may never complete the measurement.**Sub-topic 3-11 Measurement period in case of UL timing change: UE autonomous adjustment**Support option 1, for the same comments as sub-topic as 3-10. It is noted that the amount of autonomous TA adjustment can be up to several Ts, and although it is smaller compared to gNB triggered TA change, it is large enough from positioning perspective, so we prefer to define same requirements for sub-topic 3-10 and 3-11.**Sub-topic 3-12 Measurement period in case of UL timing change: *NTA\_offset* change**Support option 1. In our view *NTA\_offset* change is a very corner case, and thus no need to address it in the specification.  |
| CATT | **Sub-topic 3-1 Measurement period extension due to SSB collision**Support the recommended WF. **Sub-topic 3-2 Measurement period when configured with PRS-RSRP**Support the recommended WF.**Sub-topic 3-3 Measurement period of multiple PRS layers – overlapping case**Support the recommended WF.**Sub-topic 3-4 Measurement period of multiple PRS layers – non-overlapping case**Support the recommended WF.**Sub-topic 3-5 Measurement reporting requirements for non-periodic reporting**Sub-topic is PRS-RSRP measurement and includes the periodic reporting.**Sub-topic 3-6 SRS/PRS proximity**Support option 1b. **Sub-topic 3-7 Whether SRS periodicity should be accounted in measurement period**Support option 1. Since we support option 1 in sub-topic 3-6, the SRS periodicity is no need to be accounted in measurement period of UE Rx-Tx. **Sub-topic 3-8 Whether SRS dropping should be accounted in measurement period**Support option 1. But we are fine to add a note like option 2 in the spec for clarification. **Sub-topic 3-9 SRS/PRS being in same band**We think the two options are quite similar and slightly prefer option 2. **Sub-topic 3-10 Measurement period in case of UL timing change: TA command**Based on the previous agreement, we think the option 2b is reasonable. Option 2a is UE behavior in this case which can be implementation dependent and no need to specify. **Sub-topic 3-11 Measurement period in case of UL timing change: UE autonomous adjustment**Follow the same conclusion of sub-topic 3-10. **Sub-topic 3-12 Measurement period in case of UL timing change: *NTA\_offset* change**Support option 1.  |
| Ericsson | **Sub-topic 3-1 Measurement period extension due to SSB collision**Option is Ok**Sub-topic 3-2 Measurement period when configured with PRS-RSRP**Option 1 is Ok**Sub-topic 3-3 Measurement period of multiple PRS layers – overlapping case**Option 1 is Ok**Sub-topic 3-4 Measurement period of multiple PRS layers – non-overlapping case**Option 1 is Ok**Sub-topic 3-5 Measurement reporting requirements for non-periodic reporting**Option 1 is Ok**Sub-topic 3-6 SRS/PRS proximity**Can accept Option 3.Compromise proposal (added as Option 3): The requirements for UE Rx-Tx apply provided MIN(Tsrs, Tprs) ≤ 2\*X; X = FFS (we can accept X = 160 ms).**Sub-topic 3-7 Whether SRS periodicity should be accounted in measurement period**Option 2. **Sub-topic 3-8 Whether SRS dropping should be accounted in measurement period**Cannot agree on option 1. Prefer Option 3(b) (same as option 2) but option 3(c) is also Ok.**Sub-topic 3-9 SRS/PRS being in same band**See no strong reason to limit explicitly.**Sub-topic 3-10 Measurement period in case of UL timing change: TA command**Option 2a.**Sub-topic 3-11 Measurement period in case of UL timing change: UE autonomous adjustment**Option 2**Sub-topic 3-12 Measurement period in case of UL timing change: *NTA\_offset* change**Option 2**Sub-topic 3-13 UE Rx-Tx at cell change**Option 1 |
| Intel | **Sub-topic 3-1 Measurement period extension due to SSB collision**The recommended WF can be agreed. **Sub-topic 3-2 Measurement period when configured with PRS-RSRP**The recommended WF can be agreed. **Sub-topic 3-3 Measurement period of multiple PRS layers – overlapping case**The recommended WF can be agreed. **Sub-topic 3-4 Measurement period of multiple PRS layers – non-overlapping case**The recommended WF can be agreed. **Sub-topic 3-5 Measurement reporting requirements for non-periodic reporting**The recommended WF can be agreed. **Sub-topic 3-6 SRS/PRS proximity**Option 1a, 1b, 1c are fine for us. But slightly prefer Option 1b because of X=25 is a little bit small which can restrict NW’s configuration on PRS and SRS.For Option 2, the LTE approach can be same as NR’s if PRS periodicity is up to 320ms only. **Sub-topic 3-7 Whether SRS periodicity should be accounted in measurement period**Support Option 1 because of the clear definition in RAN1.**Sub-topic 3-8 Whether SRS dropping should be accounted in measurement period**Support Option 1.**Sub-topic 3-9 SRS/PRS being in same band**Both Option 1 and 2 are fine. They are quite same from the requirement perspective. **Sub-topic 3-10 Measurement period in case of UL timing change: TA command**Support Option 1. But Option 2a with some clarifications on the applicability can be accepted for us. For Option 2b, the same principle can be used for sub-topic 2-11. **Sub-topic 3-11 Measurement period in case of UL timing change: UE autonomous adjustment**Support Option 1.**Sub-topic 3-12 Measurement period in case of UL timing change: *NTA\_offset* change**Both options are fine for us.  |
| Qualcomm | **Sub-topic 3-1 Measurement period extension due to SSB collision**Option 1: Follow the same conclusion as RSTD in sub-topic 1-1**Sub-topic 3-2 Measurement period when configured with PRS-RSRP**Option 1: Follow the same conclusion as RSTD in sub-topic 1-4**Sub-topic 3-3 Measurement period of multiple PRS layers – overlapping case**Option 1: Follow the same conclusion as RSTD in sub-topic 1-5**Sub-topic 3-4 Measurement period of multiple PRS layers – non-overlapping case**Option 1: Follow the same conclusion as RSTD in sub-topic 1-6**Sub-topic 3-5 Measurement reporting requirements for non-periodic reporting**Option 1: Follow the same conclusion as RSTD in sub-topic 2-5**Sub-topic 3-6 SRS/PRS proximity**We propose that the discussion in GTW focuses on reaching a compromise around options 1a, 1b and 1c. The discussion should address/consider error margin to be added to the accuracy requirements due to timing drift and user mobility.* + Option 1a (ZTE): X=50ms
	+ Option 1b (CATT, HW, Intel): X=160ms
	+ Option 1c (QC): X=25ms

**Sub-topic 3-7 Whether SRS periodicity should be accounted in measurement period**Option 1: No**Sub-topic 3-8 Whether SRS dropping should be accounted in measurement period**Option 1a: No**Sub-topic 3-9 SRS/PRS being in same band**Option 1 would be agreeable to us. The intention behind option 2 is to make sure that the case of SRS/PRS in the same band is prioritized while not precluding further discussion on requirements for SRS/PRS in different bands (with lower priority).Note that UE Rx-Tx time difference with SRS/PRS in different bands would have additional complexity in front-end delay calibration (separate Tx and Rx delay cal. required on each band). Also UE support for SRS/PRS in different bands may not be defined correctly in Rel-16.**Sub-topic 3-10 Measurement period in case of UL timing change: TA command**Option 2b: UE Rx-Tx time difference measurement requirements are not applicable if TA change is received during the measurement period.Regarding option 1, we are concerned that it would cause problems for RTT positioning. E.g. a UE Rx-Tx measurement before TA change and a gNB Rx-Tx measurement after TA change could be combined to obtain RTT without knowing that there was a TA change in between. Therefore, there would be an error in RTT proportional to the TA change. If the combining is done at LMF it seems there would be no way to compensate for it.**Sub-topic 3-11 Measurement period in case of UL timing change: UE autonomous adjustment**Option 1: UE should continue Rx-Tx time difference measurement (existing requirements are applicable).UE should be allowed to change its timing autonomously to maintain a consistent timing relative to the serving cell. These timing changes should be incremental.**Sub-topic 3-12 Measurement period in case of UL timing change: *NTA\_offset* change**While we think it is unnecessary to clarify this point, we could compromise on option 2. To our knowledge, the proponents of option 2 have not offered any specific scenarios to justify their concern. |
| OPPO | **Sub-topic 3-6 SRS/PRS proximity**Support option 1.**Sub-topic 3-7 Whether SRS periodicity should be accounted in measurement period**Support option 1.**Sub-topic 3-8 Whether SRS dropping should be accounted in measurement period**Support option 1.**Sub-topic 3-9 SRS/PRS being in same band**Support option 1.**For sub-topic 3-1, 3-2, 3-3, 3-4, 3-5****Support the recommended WF.** |

### CRs/TPs comments collection

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2015755 (Huawei) | CATT: * there is a typo in 9.9.4.5
* pending on the conclusion of measurement period discussed above.
 |
| Ericsson: overlaps with Ericsson’s CR in R4-2016395 |
| Intel: suggest to merged with other companies CR to avoid overlapping contents  |
| Qualcomm: Pending conclusion of sub-topic 3-6. |
| R4-2016395 (Ericsson) | Huawei: Need to wait for conclusion for sub-topic 3-3 and 3-4. [Ericsson]: The CR actually is addressing several issues, not just the measurement period. |
| Intel: can’t be agree before the technical issues are resolved.  |
| Qualcomm: Changes to measurement period are not agreeable. Also, need to clarify the change in the definition of T\_PRS,i. |
| R4-2016559 (Qualcomm) | Huawei: Need to wait for conclusion for sub-topic 3-10. |
| Ericsson: overlaps with Ericsson’s CR in R4-2016395 |
|  |

## 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.*

|  |  |
| --- | --- |
| **Sub-topic#1** | **Sub-topic 3-1 Measurement period extension due to SSB collision***Tentative agreements:*Follow the same conclusion for RSTD (in sub-topic 1-3). *Candidate options:**Recommendations for 2nd round:*Closed, no further discussion needed. |
| **Sub-topic#2** | **Sub-topic 3-2 Measurement period when configured with PRS-RSRP***Tentative agreements:*Follow the same conclusion for RSTD (in sub-topic 1-4). *Candidate options:**Recommendations for 2nd round:*Closed, no further discussion needed. |
| **Sub-topic#3** | **Sub-topic 3-3 Measurement period of multiple PRS layers – overlapping case***Tentative agreements:*Follow the same conclusion for RSTD (in sub-topic 1-5). *Candidate options:**Recommendations for 2nd round:*Closed, no further discussion needed. |
| **Sub-topic#4** | **Sub-topic 3-4 Measurement period of multiple PRS layers – non-overlapping case***Tentative agreements:*Follow the same conclusion for RSTD (in sub-topic 1-6). *Candidate options:**Recommendations for 2nd round:*Closed, no further discussion needed. |
| **Sub-topic#5** | **Sub-topic 3-5 Measurement reporting requirements for non-periodic reporting***Tentative agreements:*Follow the same conclusion for PRS-RSRP (in sub-topic 2-5). Remove the following editor note in clause 9.9.4.4. *Editor’s note: the measurement reporting requirements for aperiodic reports are FFS.* *Candidate options:**Recommendations for 2nd round:*Closed, no further discussion needed. |
| **Sub-topic#6** | **Sub-topic 3-6 SRS/PRS proximity***Tentative agreements:*No tentative agreement in 1st round. *Candidate options:** Option 1 (ZTE, CATT, HW, QC, Intel, OPPO): The measurement requirements are 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 is independent of PRS and SRS separation.
	+ Option 1a (ZTE, Intel): X=50ms
	+ Option 1b (CATT, HW, Intel): X=160ms
	+ Option 1c (QC, Intel): X=25ms
* Option 2 (Ericsson): The requirements for UE Rx-Tx apply regardless of the time separation between SRS and PRS (LTE approach)
* Option 3 (compromise proposal from Ericsson): The requirements for UE Rx-Tx apply provided MIN(Tsrs, Tprs) ≤ 2\*X; X = FFS (we can accept X = 160 ms).

*Recommendations for 2nd round:*Continue discussion in the 2nd round and the agreement will be captured in the WF. |
| **Sub-topic#7** | **Sub-topic 3-7 Whether SRS periodicity should be accounted in measurement period***Tentative agreements:*No tentative agreement in 1st round. *Candidate options:** Option 1 (CATT, HW, QC, Intel, OPPO): No
* Option 2 (Ericsson): Yes, $T\_{UERxTx,Total}$ can be extended if the SRS periodicity is longer than max($T\_{PRS,i}$)

*Recommendations for 2nd round:*Continue discussion in the 2nd round and the agreement will be captured in the WF. |
| **Sub-topic#8** | **Sub-topic 3-8 Whether SRS dropping should be accounted in measurement period***Tentative agreements:*No tentative agreement in 1st round. Option 2 and option 3b are merged. Option 3a is removed as no company indicated support in the comments.*Candidate options:** Option 1 (CATT, HW, QC, Intel, OPPO): No
* Option 3b (Ericsson, CATT): UE is allowed to extend the UE Rx-Tx measurement period (clarified in the requirements), but the exact value is not specified.
* Option 3c (Ericsson): The UE Rx-Tx requirements apply, regardless of how many SRS are dropped.

*Recommendations for 2nd round:*Continue discussion in the 2nd round and the agreement will be captured in the WF. |
| **Sub-topic#9** | **Sub-topic 3-9 SRS/PRS being in same band***Tentative agreements:*No tentative agreement in 1st round. *Candidate options:** Option 1 (HW, Intel, QC, OPPO): RAN4 to define Rx-Tx time difference requirements only for the case where SRS resource is in the same band as PRS resource
* Option 2 (QC, CATT, Ericsson, Intel): 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 layers

*Recommendations for 2nd round:*Continue discussion in the 2nd round and the agreement will be captured in the WF. |
| **Sub-topic#10** | **Sub-topic 3-10 Measurement period in case of UL timing change: TA command***Tentative agreements:*No tentative agreement in 1st round. *Candidate options:** Option 1 (HW, Intel): UE should continue Rx-Tx time difference measurement (existing requirements are applicable)
* Option 2a (Ericsson, Intel): 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
* Option 2b (QC, CATT): UE Rx-Tx time difference measurement requirements are not applicable if TA change is received during the measurement period.

*Recommendations for 2nd round:*Continue discussion in the 2nd round and the agreement will be captured in the WF. |
| **Sub-topic#11** | **Sub-topic 3-11 Measurement period in case of UL timing change: UE autonomous adjustment***Tentative agreements:*No tentative agreement in 1st round. One option is added based on company comments.*Candidate options:** Option 1 (HW, Intel, QC): UE should continue Rx-Tx time difference measurement (existing requirements are applicable)
* Option 2 (Ericsson): 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
* Option 3 (CATT, HW): follow the same conclusion from sub-topic 3-10.

*Recommendations for 2nd round:*Continue discussion in the 2nd round and the agreement will be captured in the WF. |
| **Sub-topic#12** | **Sub-topic 3-12 Measurement period in case of UL timing change: *NTA\_offset* change***Tentative agreements:*No tentative agreement in 1st round. *Candidate options:** Option 1 (CATT, HW, QC, Intel): No need to clarify UE Rx-Tx measurement requirements in case of NTA\_offset change
* Option 2 (Ericsson, Intel, QC): 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.

*Recommendations for 2nd round:*Continue discussion in the 2nd round and the agreement will be captured in the WF. |
| **Sub-topic#13** | **Sub-topic 3-13 UE Rx-Tx at cell change***Tentative agreements:*No tentative agreement in 1st round. This is a new sub-topic suggested by company comments. Based on moderator’s understanding, the issue was already concluded in RAN4#96-e with the following agreement in R4-2012283, but we can discuss option 1 in the 2nd round.Measurement period in case of HOUE restarts the measurement*Candidate options:** Option 1 (Ericsson): The UE Rx-Tx time difference measurement is restarted if the serving cell (PCell, PSCell, or SCell) configured with the SRS for positioning changes during the measurement period. 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, the UE shall continue the on-going UE Rx-Tx time difference measurement after the serving cell change.

*Recommendations for 2nd round:*Continue discussion in the 2nd round and the agreement will be captured in the WF.Take into account the existing agreement. |

*Recommendations 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 provides recommendation on CRs/TPs Status update*

|  |  |
| --- | --- |
| **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)

**Sub-topic 3-6 SRS/PRS proximity**

*Candidate options:*

* Option 1 (ZTE, CATT, HW, QC, Intel, OPPO): The measurement requirements are 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 is independent of PRS and SRS separation.
	+ Option 1a (ZTE, Intel): X=50ms
	+ Option 1b (CATT, HW, Intel): X=160ms
	+ Option 1c (QC, Intel): X=25ms
* Option 2 (Ericsson): The requirements for UE Rx-Tx apply regardless of the time separation between SRS and PRS (LTE approach)
* Option 3 (compromise proposal from Ericsson): The requirements for UE Rx-Tx apply provided MIN(Tsrs, Tprs) ≤ 2\*X; X = FFS (we can accept X = 160 ms).

*Recommendations for 2nd round:*

Continue discussion in the 2nd round and the agreement will be captured in the WF.

|  |  |
| --- | --- |
| **Company** | **Comments**  |
| Intel | Support Option 1. Option 3 can be accepted as compromise. |
| ZTE | Support Option 1a. We can also compromise to X = 80 ms. |
| OPPO | We can also compromise to option 3. |
| Ericsson | Option 2 or Option 3 |
| Qualcomm | We could compromise to X = 80 ms. Would that be acceptable to others? |
| Huawei | We can accept X=80ms as a compromise. |
| CATT | Support option 1.  |

**Sub-topic 3-7 Whether SRS periodicity should be accounted in measurement period**

*Candidate options:*

* Option 1 (CATT, HW, QC, Intel, OPPO): No
* Option 2 (Ericsson): Yes, $T\_{UERxTx,Total}$ can be extended if the SRS periodicity is longer than max($T\_{PRS,i}$)

*Recommendations for 2nd round:*

Continue discussion in the 2nd round and the agreement will be captured in the WF.

|  |  |
| --- | --- |
| **Company** | **Comments**  |
| Intel | Support Option 1 |
| OPPO | Still option 1 |
| Ericsson | Option 2 (compromise: no need to specify how much longer). |
| Qualcomm | Option 1 |
| Huawei | Option 1. |
| CATT | Support option 1.  |

**Sub-topic 3-8 Whether SRS dropping should be accounted in measurement period**

*Candidate options:*

* Option 1 (CATT, HW, QC, Intel, OPPO): No
* Option 3b (Ericsson, CATT): UE is allowed to extend the UE Rx-Tx measurement period (clarified in the requirements), but the exact value is not specified.
* Option 3c (Ericsson): The UE Rx-Tx requirements apply, regardless of how many SRS are dropped.

*Recommendations for 2nd round:*

Continue discussion in the 2nd round and the agreement will be captured in the WF.

|  |  |
| --- | --- |
| **Company** | **Comments**  |
| Intel | Support Option 1 |
| Ericsson | 3b or 3c |
| Qualcomm | We favor option 1. Option 3c would not be acceptable. |
| Huawei | Option 1. |
| CATT | Support option 1, option 3b can be acceptable compromise.  |

**Sub-topic 3-9 SRS/PRS being in same band**

*Candidate options:*

* Option 1 (HW, Intel, QC, OPPO): RAN4 to define Rx-Tx time difference requirements only for the case where SRS resource is in the same band as PRS resource
* Option 2 (QC, CATT, Ericsson, Intel): 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 layers

*Recommendations for 2nd round:*

Continue discussion in the 2nd round and the agreement will be captured in the WF.

|  |  |
| --- | --- |
| **Company** | **Comments**  |
| Intel | Both options are fine |
| Ericsson | Option 2. |
| Qualcomm | We’re fine with either option. |
| Huawei | No strong view |
| CATT | We think the two options have no difference, slightly prefer option 2.  |

**Sub-topic 3-10 Measurement period in case of UL timing change: TA command**

*Candidate options:*

* Option 1 (HW, Intel): UE should continue Rx-Tx time difference measurement (existing requirements are applicable)
* Option 2a (Ericsson, Intel): 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
* Option 2b (QC, CATT): UE Rx-Tx time difference measurement requirements are not applicable if TA change is received during the measurement period.

*Recommendations for 2nd round:*

Continue discussion in the 2nd round and the agreement will be captured in the WF.

|  |  |
| --- | --- |
| **Company** | **Comments**  |
| Intel | Prefer Option 1. Option 2a with some clarifications on the applicability can be accepted for us.  |
| OPPO | Option 2b is fine |
| Ericsson | Option 2a. We can further clarify that accuracy requirements are not applicable for this case.Option 2b is not applicable because the UE will still report wrong measurements. |
| Qualcomm | We support option 2b for the reasons stated in round 1. |
| Huawei | Support option 1, same comments as in first round. |
| CATT | Prefer option 2b.  |

**Sub-topic 3-11 Measurement period in case of UL timing change: UE autonomous adjustment**

*Candidate options:*

* Option 1 (HW, Intel, QC): UE should continue Rx-Tx time difference measurement (existing requirements are applicable)
* Option 2 (Ericsson): 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
* Option 3 (CATT, HW): follow the same conclusion from sub-topic 3-10.

*Recommendations for 2nd round:*

Continue discussion in the 2nd round and the agreement will be captured in the WF.

|  |  |
| --- | --- |
| **Company** | **Comments**  |
| Intel | Support Option 1 |
| ZTE | Prefer Option 1. |
| OPPO | Option 3, follow the same conclusion from sub-topic 3-10. |
| Ericsson | Option 2. We can further clarify that accuracy requirements are not applicable for this case. |
| Qualcomm | We support option 1. |
| Huawei | Support option 1, same comments as in first round. Technically it is same as option 3. |
| CATT | Support option 3.  |

**Sub-topic 3-12 Measurement period in case of UL timing change: *NTA\_offset* change**

*Candidate options:*

* Option 1 (CATT, HW, QC, Intel): No need to clarify UE Rx-Tx measurement requirements in case of NTA\_offset change
* Option 2 (Ericsson, Intel, QC): 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.

*Recommendations for 2nd round:*

Continue discussion in the 2nd round and the agreement will be captured in the WF.

|  |  |
| --- | --- |
| **Company** | **Comments**  |
| Intel | No strong preference |
| Ericsson | Option 2. We can further clarify that accuracy requirements are not applicable for this case. |
| Qualcomm | We’re fine with either option. |
| Huawei | Support option 1, still not clear which scenario is considered for NTA\_offset change. |
| CATT | Support option 1.  |

**Sub-topic 3-13 UE Rx-Tx at cell change**

*Candidate options:*

* Option 1 (Ericsson): The UE Rx-Tx time difference measurement is restarted if the serving cell (PCell, PSCell, or SCell) configured with the SRS for positioning changes during the measurement period. 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, the UE shall continue the on-going UE Rx-Tx time difference measurement after the serving cell change.

*Recommendations for 2nd round:*

Continue discussion in the 2nd round and the agreement will be captured in the WF.

In RAN4#96-e, RAN4 concluded UE Rx-Tx measurement requirements for HO case (R4-2012283), but not for other cell changes which were agreed by RAN4 in the WF at RAN4#93 [R4-1915854]:

|  |
| --- |
| If the cell change occurs on the serving cell where the SRS is configured then after the serving cell change:o the UE shall restart the UE Rx-Tx time difference measurement;otherwise the UE shall continue the ongoing UE Rx-Tx time difference measurement. |

This means if the serving cell, which does not have SRS, changes then the UE can continue the UE Rx-Tx time difference measurement. The reason is that in this case the serving cell change does not impact the on-going UE Rx-Tx time difference measurement.

Companies are encouraged to provide comments on option 1 based on above clarification.

|  |  |
| --- | --- |
| **Company** | **Comments**  |
| Intel | Support Option 1 which is aligned with RAN4 previous agreements |
| OPPO | Option 1 is fine |
| Ericsson | Option 1, it’s based on the earlier RAN4 agreement. |
| Qualcomm | This proposal needs to be looked carefully. Potentially there could be many corner cases in which it may not make sense or be possible for the UE Rx-Tx measurement to continue without interruption. E.g. if PCell changes and the SCell configured with SRS is deactivated. |
| Huawei | Technically, we agree that if the cell change does not impact UE UL timing (SRS configuration is just one case), then UE should continue the Rx-Tx measurement. However, the need to capture anything here is questionable, e.g. cell change (not HO) is an RRC reconfiguration, and there are many RRC reconfigurations, e.g. to update MO list, to update CSI reporting periodicity, and they are irrelevant to Rx-Tx measurement (same as the cell change scenario addressed in option 1). So our question is why we need to particularly address the cell change scenario? Do we also need to capture in the spec that UE should continue Rx-Tx measurement e.g. in case CSI reporting periodicity is reconfigured? |
| CATT | Generally fine with option 1.  |

## 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**  |
| R4-2017143 | WF on UE PRS measurement requirements*Sub-topic 3-9, some companies prefer option 2, other companies do not have strong view, so option 2 is agreed in the 2nd round as captured in the WF* * *SRS/PRS being in same band*
	+ *Option 2: 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*

*For other sub-topic, no further agreement in 2nd round. Open issues and possible options are captured in the WF* |

# Topic #4: Other requirements

## Companies’ contributions summary

*Note: Proposal 2 of R4-2014003 is to be treated in email 214. Proposal 1 of R4-2016394 is to be treated in email 214. Proposal 3 of R4-2015754 is to be treated under Topic 4.*

*Note: For some sub-topics, proposals from companies are same as those for RSTD in Topic 1 or for PRS-RSRP in Topic 2. For these sub-topics, moderator suggests to avoid duplicating the discussions and follow the same conclusions for RSTD or PRS-RSRP.*

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2014005**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014005.zip) | ZTE Corporation | **Proposal 1: The measurement gap is split between RRM measurements and PRS measurements by a certain percentage X%.****Proposal 2: The measurement gap is split between RRM measurements and PRS measurements by a certain percentage 70%. The value of X can be further discussed.** |
| [**R4-2014282**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014282.zip) | Apple | LS on new per-UE MG for NR positioning In R4-2012285, RAN4 has informed about the agreement in RAN4 #96e meeting to specify two new measurement gap patterns for NR positioning measurement. In addition, followings have been concluded in RAN4 as well:These two new MG patterns are applicable for PRS and NR/LTE RRM measurements, i.e. new gaps are not shared between PRS and 2G/3G RRM measurements.These two new MG patterns are defined as per-UE capabilities, i.e., new positioning MG is defined for per-UE MG only. |
| [**R4-2015756**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015756.zip) | Huawei, HiSilicon | **Proposal 1: CSSF is only for the MG sharing between PRS and RRM layers.****Proposal 2: Define CSSF based on PRS resource periodicity.****Proposal 3: A PRS layer is categorized as long periodicity measurement if PRS resource periodicity multiplied by the product of *dl-prs-MutingBitRepetitionFactor* and number of consecutive zeros in *NR-MutingPattern-r16* is >= 160ms.****Proposal 4: Count only a single PRS layer for a gap occasion in CSSF calculation for both PRS and RRM layers.** |
| [**R4-2015757**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015757.zip) | Huawei, HiSilicon | CR based on R4-2015757 |
| [**R4-2015758**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015758.zip) | Huawei, HiSilicon | CR to introduce new measurement gap patterns for positioning in 36.133 |
| [**R4-2016156**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016156.zip) | Nokia, Nokia Shanghai Bell | CR on Refinements on CSSF within gap to include NR positioning measurementsIn sub-clauses 9.1.5 and 9.1.5.2, the term “NR measurements for positioning” is used to cover both NR PRS measurements and NR E-CID measurements in clause 9.9.In sub-clauses 9.1.5.2.5 to 9.1.5.2.7, the term “NR PRS measurements for positioning” is used to cover NR PRS measurements.Applicability of CSSFwithin\_gap,i=1, i.e.long-periodicity NR measurements for positioning, related to PRS periodicities ≤160 ms is fixed taking into account muting patterns, i.e. effective PRS periodicity of 320 ms or larger defines a long-periodicity NR measurement).Sub-clauses 9.1.5.2.5 to 9.1.5.2.7 for PRS measurements point to sub-clauses 9.1.5.2.2 to 9.1.5.2.4 related to CSSF sharing rules within measurement gaps. |
| [**R4-2016505**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016505.zip) | Qualcomm Incorporated | **Proposal: If the time span of a DL PRS resource instance is greater than UE reported capability N, measurement requirements do not apply for this resource.****Proposal: If the time span of a DL PRS resource instance is greater than the configured measurement gap length, measurement requirements do not apply for this resource.****Proposal: For position frequency layers, calculate** $CSSF\_{PRS,i}$ **based on the maximum periodicity across all the PRS resources within each layer and taking into account type2 (inter-period) muting.** |
| [**R4-2016556**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016556.zip) | Qualcomm Incorporated | CR based on R4-2016505 |
| [**R4-2016396**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016396.zip) | Ericsson | * ***Proposal 1****: Long-periodicity NR measurements are the measurements with PRS periodicity >160 ms (with or without muting) or equal 160 ms (with muting).*
 |
| [**R4-2016397**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016397.zip) | Ericsson | CR based on R4-2016396 |
| [**R4-2015750**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015750.zip) | Huawei, HiSilicon | **Proposal 5: 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 PRS resource is across two sampling duration of N within duration Lprs**
 |
| [**R4-2015751**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015751.zip) | Huawei, HiSilicon | CR based on [R4-2015750](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015750.zip) |

## Open issues summary

### Sub-topic 4-1 Framework in defining CSSF for RRM/PRS MG sharing

* Option 1 (ZTE): The measurement gap is split between RRM measurements and PRS measurements by a certain percentage X%, X=[70]
* Option 2 (existing requirement): If measurement of a PRS layer is considered as long periodicity measurement, CSSF for this PRS layer is 1, otherwise this PRS layer would compete for MG with other MG-based RRM measurement.

Recommended WF: Further discussion needed. Collect companies’ views.

### Sub-topic 4-2 Condition of long periodicity PRS measurement

*Note: the sub-topic is related to the FFS in Table 9.1.5.2.2-1 in 38.133.*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Table 9.1.5.2.2-1: PRS configurations for long-periodicity NR measurements for positioning

|  |  |
| --- | --- |
| [PRS periodicity] (ms) | DL-PRS-MutingPattern configuration |
| 320, 640, … ,10240 | [With or without muting] |
| Other values (≤ 160) | FFS |

 |

* Option 1a (HW): Tprs \* X \* *dl-prs-MutingBitRepetitionFactor* >=160ms
	+ X is the number of consecutive zeros in *NR-MutingPattern-r16*
* Option 1b (QC): max(Tprs \* X \* *dl-prs-MutingBitRepetitionFactor*) >=320ms
	+ X is the length of *NR-MutingPattern-r16*
* Option 1c (Nokia): Tprs \* X >=320ms
	+ X is the size of MutingPattern
* Option 1d (Ericsson): Long-periodicity NR measurements are the measurements with PRS periodicity >160 ms (with or without muting) or equal 160 ms (with muting)

Recommended WF: Further discussion needed. Collect companies’ views.

### Sub-topic 4-3 Different resource periodicities in a PRS layer

*Note: PRS resources in the same PRS layer can have different periodicities. The sub-topic is about which periodicity is used to represent the PRS layer in CSSF calculation. This is related to not only whether measurement of the PRS layer is a long periodicity measurement, but also the MG competition when the PRS layer is not considered as long periodicity measurement.*

* Option 1 (QC): For position frequency layers, calculate $CSSF\_{PRS,i}$ based on the maximum periodicity across all the PRS resources within each layer and taking into account type1 (inter-period) muting

Recommended WF: Further discussion needed. Collect companies’ views.

### Sub-topic 4-4 Number of PRS layers to be counted in CSSF calculation

*Note: the sub-topic is related to the TBD in the following texts in 38.133.*

|  |
| --- |
| For each measurement gap *j* not used for a long-periodicity measurement defined above, count the total number of intra-frequency measurement objects and inter-frequency/inter-RAT measurement objects and [TBD for NR positioning measurements] which are candidates to be measured within the gap *j*. |

* Option 1 (HW): CSSF is only for the MG sharing between PRS and RRM layers. Count only a single PRS layer for a gap occasion in CSSF calculation for both PRS and RRM layers.
* Option 2 (Ericsson): frequency layers for PRS-based positioning measurements

Recommended WF: Further discussion needed. Collect companies’ views.

### Sub-topic 4-5 Applicable scenarios for PRS measurement requirements

* Option 1 (HW, QC): The measurement requirements do not apply for a PRS resource, if time span of the PRS resource instance is greater than UE reported capability N.
* Option 2 (QC): The measurement requirements do not apply for a PRS resource, if the time span of a DL PRS resource instance is greater than the configured measurement gap length
* Option 3 (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

Recommended WF: Further discussion needed. Collect companies’ views. Please note that the listed options are not exclusive to each other, and you can indicate support of none, one or more of the options in your comments.

### Sub-topic 4-6 LS on new per-UE MG for NR positioning (R4-2014282)

Recommended WF: Collect companies’ views on the LS.

### Sub-topic 4-7 UE capability for additional measurement gap patterns for PRS measurements

*Based on the GTW discussion in the Main session on the Rel-16 UE feature list on 3rd Nov (summary document can be found* [*here*](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_97_e/Inbox/Drafts/%5B97e%5D%5B100%5D%20Main_Session/GTW_Nov03/Draft%20email%20discussion%20summary%20for%20%5B97e%5D%5B117%5D%20R16_UE_%20feature%20-%20GTW.docx)*), Issue 8-1 (UE capability for additional measurement gap patterns for PRS measurements) will be discussed further in email 213. This sub-topic is to collect companies’ views on the proposed UE capability*

*Note: there are typos for MGL and MGRP in Component 2, and it is corrected with change marks based on moderator’s understanding.*

Recommended WF: Please provide your comments on UE feature 11-1 in the next page.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Features | Index | Feature group | Components | Prerequisite feature groups | Need for the gNB to know if the feature is supported | Applicable to the capability signalling exchange between UEs (V2X WI only)”. | **Consequence if the feature is not supported by the UE** | **Type****(the ‘type’ definition from UE features should be based on the granularity of 1) Per UE or 2) Per Band or 3) Per BC or 4) Per FS or 5) Per FSPC)** | Need of FDD/TDD differentiation | Need of FR1/FR2 differentiation | Capability interpretation for mixture of FDD/TDD and/or FR1/FR2 | Note | Mandatory/Optional |
| 11. NR Positioning | 11-1 | Additional measurement gap patterns for PRS measurements | 1. MG pattern with MGL=10 ms, MGRP=80 ms for PRS measurements
2. MG pattern with MGL=20 ms, MGRP=160 ms for PRS measurements
 | RAN1 feature list: 13-1 Common DL PRS Processing Capability | Yes | N/A | The network cannot configure additional MG patterns for PRS measurements | Per UE | No | No | N/A | New MG patterns are applicable for PRS and NR/LTE RRM measurements i.e. new gaps are not shared between PRS and 2G/3G RRM measurements.The new measurement gap patterns can be requested by the UE for FDD and TDD NR positioning measurements.The new measurement gap patterns can be requested by the UE and configured by the network only when the UE is configured via LPP with NR positioning measurements requiring such gaps and can only be used during the corresponding positioning measurement period. | Optional with capability signalling |
|  |  |  |  |  |  |  |  |  |  |  |  |  |

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
|  | **Sub-topic 4-1 Framework in defining CSSF for RRM/PRS MG sharing****Sub-topic 4-2 Condition of long periodicity PRS measurement****Sub-topic 4-3 Different resource periodicities in a PRS layer****Sub-topic 4-4 Number of PRS layers to be counted in CSSF calculation****Sub-topic 4-5 Applicable scenarios for PRS measurement requirements****Sub-topic 4-6 LS on new per-UE MG for NR positioning (R4-2014282)****Sub-topic 4-7 UE capability for additional measurement gap patterns for PRS measurements** |
| ZTE | **Sub-topic 4-1 Framework in defining CSSF for RRM/PRS MG sharing**We can support Option 2.**Sub-topic 4-3 Different resource periodicities in a PRS layer**We prefer to further study this problem since it will impact several other issues.**Sub-topic 4-4 Number of PRS layers to be counted in CSSF calculation**Slightly prefer Option 2. |
| Huawei | **Sub-topic 4-1 Framework in defining CSSF for RRM/PRS MG sharing**Support option 2.**Sub-topic 4-2 Condition of long periodicity PRS measurement**Support option 1a, which in our view is the most accurate one. On option 1b, the PRS resource availability should depend on number of consecutive zeros but not the bit-length of the muting pattern. E.g. the muting pattern is configured with 4 bits 1011, and in this case the available periodicity is extended twice but not 4 times. The same issue applies to option 1c, and in addition the MutingBitRepetitionFactor should be considered. **Sub-topic 4-3 Different resource periodicities in a PRS layer**We need more time to check. If we take an example of PRS layer with 2 resources, Res1 with 80ms period and Res2 with 320ms, option 1 means the CSSF for this PRS layer is defined based on 320ms. One issue with this option is that there would be no opportunity for UE to measure the additional PRS samples for Res1. In worst case, if the time offsets are different for the two resources, UE will have no opportunity at all to measure Res1. **Sub-topic 4-4 Number of PRS layers to be counted in CSSF calculation**Support option 1. The issue is related to sub-topic 1-5, and as we commented there, current CSSF cannot work for MG sharing between PRS layers, so we suggest that CSSF is only for the MG sharing between PRS and RRM layers. In this case, it is reasonable to count only a single PRS layer for a gap occasion.**Sub-topic 4-5 Applicable scenarios for PRS measurement requirements**We support all 3 options. **Sub-topic 4-6 LS on new per-UE MG for NR positioning (R4-2014282)**We are fine to send the LS.**Sub-topic 4-7 UE capability for additional measurement gap patterns for PRS measurements**We are fine with the proposed UE capability 11-1, which is aligned with RAN4 agreements in last meeting. |
| CATT | **Sub-topic 4-1 Framework in defining CSSF for RRM/PRS MG sharing**Support option 2. **Sub-topic 4-2 Condition of long periodicity PRS measurement**Long-periodicity PRS means the PRS periodicity in each frequency layer defined in sub-topic 1-2 is larger than or equal to [320]ms. **Sub-topic 4-3 Different resource periodicities in a PRS layer**Follow the same conclusion of sub-topic 1-2. **Sub-topic 4-4 Number of PRS layers to be counted in CSSF calculation**Support option 1. **Sub-topic 4-5 Applicable scenarios for PRS measurement requirements**We are fine with option 1 and option 2. For option 3, how does the UE decide whether the Lprs is across two sampling duration of N? In my understanding, the N defined in RAN1 just a time duration without definition of start and end. Some further clarification may be needed. **Sub-topic 4-6 LS on new per-UE MG for NR positioning (R4-2014282)**Fine with the LS. **Sub-topic 4-7 UE capability for additional measurement gap patterns for PRS measurements**We are fine with the proposed UE capability. |
| Ericsson | **Sub-topic 4-1 Framework in defining CSSF for RRM/PRS MG sharing**Option 2**Sub-topic 4-2 Condition of long periodicity PRS measurement**Option 1d **Sub-topic 4-3 Different resource periodicities in a PRS layer**Not needed. We should take the per-gap approach, as it is in Rel-15.**Sub-topic 4-4 Number of PRS layers to be counted in CSSF calculation**Option 2, ie., rel-15 approach and whichever are configured to be counted.**Sub-topic 4-5 Applicable scenarios for PRS measurement requirements**These conditions are not needed. We already refer to measurement capabilities in the requirements.**Sub-topic 4-6 LS on new per-UE MG for NR positioning (R4-2014282)**For completeness, the following can also be added:“The new measurement gap patterns can be requested by the UE for FDD and TDD NR positioning measurements.The new measurement gap patterns can be requested by the UE and configured by the network only when the UE is configured via LPP with NR positioning measurements requiring such gaps and can only be used during the corresponding positioning measurement period.”**Sub-topic 4-7 UE capability for additional measurement gap patterns for PRS measurements**Ok |
|  | **Sub-topic 4-1 Framework in defining CSSF for RRM/PRS MG sharing**Support Option 2. **In the last meeting, existing CCSF (e.g. =1 for longer PRS periodcity) was agreed for new gap pattern, which can be used to resolve the gap competition between PRS measurement and legacy RRM.[** R4-2012298]**Sub-topic 4-2 Condition of long periodicity PRS measurement**Can be FFS. In our view, the length of “*NR-MutingPattern-r16* “ and *dl-prs-MutingBitRepetitionFactor* effect the periodicity of available PRS ( the distance between two adjacent PRS occasion) similarly.  For an example, in the figure below the total PRS periodicity was extended by 2. Thus all the option1a and 1b counted the periodicity extension redundantly here. **Sub-topic 4-3 Different resource periodicities in a PRS layer**Support Option 1. **Sub-topic 4-4 Number of PRS layers to be counted in CSSF calculation**Support Option 1. The gap sharing among the PRS layers may be addressed by LCM(Tprs,i) already.**Sub-topic 4-5 Applicable scenarios for PRS measurement requirements**These options can be applicable together? So the option 1 and 3 can be fine for us. For option 2, UE can handle this PRS twice. **Sub-topic 4-6 LS on new per-UE MG for NR positioning (**[**R4-2014282**](file:///C%3A%5CUsers%5Crhuang5%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C97e%5CDocs%5CR4-2014282.zip)**)**Can be agreed. **Sub-topic 4-7 UE capability for additional measurement gap patterns for PRS measurements**We are fine with the proposed UE capability. |
| Qualcomm | **Sub-topic 4-1 Framework in defining CSSF for RRM/PRS MG sharing**Needs further discussion. Leaning towards option 2.Option 2 (existing requirement): If measurement of a PRS layer is considered as long periodicity measurement, CSSF for this PRS layer is 1, otherwise this PRS layer would compete for MG with other MG-based RRM measurement.**Sub-topic 4-2 Condition of long periodicity PRS measurement**Both options 1a and 1b recognize the need to account for type1 muting and *dl-prs-MutingBitRepetitionFactor.* Option 1b is a simplified version of 1a (assuming worst-case)*.* We could support either. Since long periodicity condition refers to a positioning frequency layer, this discussion should consider the outcome of sub-topic 1-2. Additionally, we think the current PRS measurement period requirements as captured in TS 38.133 sections 9.9.2, 9.9.3 and 9.9.4 do not correctly account for PRS muting and need to be modified.**Sub-topic 4-3 Different resource periodicities in a PRS layer**Option 1 should be adjusted based on the outcome of sub-topic 1-2.**Sub-topic 4-4 Number of PRS layers to be counted in CSSF calculation**Option 1: CSSF is only for the MG sharing between PRS and RRM layers. Count only a single PRS layer for a gap occasion in CSSF calculation for both PRS and RRM layers.**Sub-topic 4-5 Applicable scenarios for PRS measurement requirements**We support the first two options. It seems that option1 implies option 3. If not, it needs clarification.* Option 1: The measurement requirements do not apply for a PRS resource, if time span of the PRS resource instance is greater than UE reported capability N.
* Option 2: The measurement requirements do not apply for a PRS resource, if the time span of a DL PRS resource instance is greater than the configured measurement gap length
* Option 3: The measurement requirements do not apply for a PRS resource, if the PRS resource is across two sampling duration of N within duration Lprs

**Sub-topic 4-6 LS on new per-UE MG for NR positioning (R4-2014282)**The LS is agreeable.**Sub-topic 4-7 UE capability for additional measurement gap patterns for PRS measurements**We agree with the proposed UE capability. |
| OPPO | **Sub-topic 4-1 Framework in defining CSSF for RRM/PRS MG sharing**We can support option 2 and are open to discuss option 1.**Sub-topic 4-2 Condition of long periodicity PRS measurement**First preference is option 1b and are open to have further discussion on option 1a. Both the two options take the muting pattern and repetition factor into consideration but option 1b is simpler. Option 1a seems to be more accurate but is not workable in some complicated scenarios, for example:* If the muting pattern is 0100, the available periodicity should be extended by 4 times rather 3.
* If the muting pattern is 01001001, the number of consecutive zeros is 1 or 2, then how to determine the extension factor?

By the way, we suggest to add a clarification that “the *NR-MutingPattern-r16* is for *mutingOption1-r16*” since “*mutingOption2-r16*” also has the field “*NR-MutingPattern-r16*” but with different meaning.**Sub-topic 4-3 Different resource periodicities in a PRS layer**Agree with Huawei and please leave more time for this issue.**Sub-topic 4-4 Number of PRS layers to be counted in CSSF calculation**Support option 1**Sub-topic 4-5 Applicable scenarios for PRS measurement requirements**Can support all the 3 options. |
| Apple | **Sub-topic 4-6 LS on new per-UE MG for NR positioning (R4-2014282)**After offline checking with Ericsson, We think Ericsson is fine with the original version. Please Ericsson double confirm.  |

### CRs/TPs comments collection

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2015757 (Huawei) | CATT: pending on the conclusion of sub-topic 4-2 and sub-topic 4-4. |
| Ericsson: we do not agree, we prefer CR in R4-2016397 |
| Intel: can wait the technical discussion then one CR to collect these conclusion is preferred.  |
| Qualcomm: Need resolution of sub-topics 4-1, 4-2, 4-3 and 4-4. |
| R4-2015758 (Huawei) | Ericsson: not correct to refer to Table 9.1.2-2 only covering only some deployments. What about the deployments covered in Table 9.1.2-3? |
| Intel: there new gap can’t be used for LTE PCell/SCell in Rel16. Why shall we define them in TS36.133? |
|  |
| R4-2016156 (Nokia) | Huawei: In our view, we should not use two terms “NR measurements for positioning” and “NR PRS measurements for positioning”. The latter term alone is enough. The reason is that E-CID is based on existing RRM measurements and UE is not expected to take additional measurements for E-CID, so the measurement UE takes for E-CID are already accounted in CSSF for RRM.Some changes depends on the outcome of the sub-topics. |
| CATT: * pending on the conclusion of sub-topic 4-2 and sub-topic 4-4.
* Collide with R4-2015757
 |
| Ericsson: we prefer CR in R4-2016397 |
| Qualcomm: Need resolution of sub-topics 4-1, 4-2, 4-3 and 4-4. |
| R4-2016397 (Ericsson) | Huawei: We do not see the point to have clause 9.1.5.2.5 to 9.1.5.2.7 as they are just referring to 9.1.5.2.2 to 9.1.5.2.4.Some changes depends on the outcome of the sub-topics. |
| CATT: * pending on the conclusion of sub-topic 4-2 and sub-topic 4-4.
* Collide with R4-2015757
* Do not see the need for section 9.1.5.2.5, 9.1.5.2.6 and 9.1.5.2.7.
 |
| Intel: can wait the technical discussion then one CR to collect these conclusion for CCSF is preferred.  |
| Qualcomm: Need resolution of sub-topics 4-1, 4-2, 4-3 and 4-4. |
| R4-2016556 (Qualcomm) | Huawei: technically OK, but there are some overlapping change with other CRs, and we can discuss how to merge. Also, the change depends on the outcome of sub-topic 4-5. |
| Ericsson: do not agree with the changes, the CR is not needed |
| Intel: technically fine.  |

## 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.*

|  |  |
| --- | --- |
| **Sub-topic#1** | **Sub-topic 4-1 Framework in defining CSSF for RRM/PRS MG sharing***Tentative agreements:*In the comments, all companies can support to use existing framework to define CSSF, while some companies are open to discuss other options. Therefore, following tentative agreement is suggested.Define CSSF based on existing framework unless technical issues are identified.*Candidate options:*N/A *Recommendations for 2nd round:*This sub-topic is supposed not to be further discussed in the 2nd round, but companies can still comment if they identify any technical issue. |
| **Sub-topic#2** | **Sub-topic 4-2 Condition of long periodicity PRS measurement***Tentative agreements:*No tentative agreement in 1st round. Option 2 is added based on comments.*Candidate options:** Option 1a (HW, OPPO): Tprs \* X \* *dl-prs-MutingBitRepetitionFactor* >=160ms
	+ X is the number of consecutive zeros in *NR-MutingPattern-r16* for *mutingOption1-r16*
* Option 1b (QC, OPPO): max(Tprs \* X \* *dl-prs-MutingBitRepetitionFactor*) >=320ms
	+ X is the length of *NR-MutingPattern-r16* for *mutingOption1-r16*
* Option 1c (Nokia): Tprs \* X >=320ms
	+ X is the size of MutingPattern
* Option 1d (Ericsson): Long-periodicity NR measurements are the measurements with PRS periodicity >160 ms (with or without muting) or equal 160 ms (with muting)
* Option 2 (CATT): Long-periodicity PRS means the PRS periodicity in each frequency layer defined in sub-topic 1-2 is larger than or equal to [320]ms
* Option 3 (Intel): FFS

*Recommendations for 2nd round:*Continue discussion in the 2nd round and the agreement will be captured in the WF.Proponents of option 1c and 1d, please clarify whether muting option 1, or option 2, or both are considered. Proponent of option 2, please clarify whether muting is considered or not.Besides the definition of the long periodicity measurement, following issues are raised up by companies, and they can be discussed in the 2nd round also:* Issue 1: How to account for the conclusion from sub-topic 1-2.
* Issue 2: whether and how muting should be accounted in the PRS measurement period requirements as captured in TS 38.133 sections 9.9.2, 9.9.3 and 9.9.4
 |
| **Sub-topic#3** | **Sub-topic 4-3 Different resource periodicities in a PRS layer***Tentative agreements:*No tentative agreement in 1st round. Option 1a and option 2 are added based on comments.*Candidate options:** Option 1 (QC, Intel): For position frequency layers, calculate $CSSF\_{PRS,i}$ based on the maximum periodicity across all the PRS resources within each layer and taking into account type1 (inter-period) muting
	+ May be adjusted based on outcome of sub-topic 1-2
* Option 1a (CATT): Follow the same conclusion of sub-topic 1-2
* Option 2 (Ericsson): Not needed. We should take the per-gap approach, as it is in Rel-15.
* Option 3 (ZTE, HW, OPPO): FFS

*Recommendations for 2nd round:*Continue discussion in the 2nd round and the agreement will be captured in the WF. |
| **Sub-topic#4** | **Sub-topic 4-4 Number of PRS layers to be counted in CSSF calculation***Tentative agreements:*No tentative agreement in 1st round. *Candidate options:*N/A*Recommendations for 2nd round:*Based on GTW discussion, the sub-topic will be discussed jointly with sub-topic 1-5, so no further discussion in the 2nd round. |
| **Sub-topic#5** | **Sub-topic 4-5 Applicable scenarios for PRS measurement requirements***Tentative agreements:*No tentative agreement in 1st round. *Candidate options:** Option 1 (HW, QC, CATT, Intel, OPPO): The measurement requirements do not apply for a PRS resource, if time span of the PRS resource instance is greater than UE reported capability N.
* Option 2 (QC, HW, CATT, OPPO): The measurement requirements do not apply for a PRS resource, if the time span of a DL PRS resource instance is greater than the configured measurement gap length
* Option 3 (HW, Intel, OPPO): 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 4 (Ericsson): none of option 1~3 is needed.

*Recommendations for 2nd round:*Continue discussion in the 2nd round and the agreement will be captured in the WF. |
| **Sub-topic#6** | **Sub-topic 4-6 LS on new per-UE MG for NR positioning (R4-2014282)***Tentative agreements:*Approve the LS*Candidate options:**Recommendations for 2nd round:*Closed, no further discussion needed. |
| **Sub-topic#7** | **Sub-topic 4-7 UE capability for additional measurement gap patterns for PRS measurements***GTW agreements:*Add a new feature to the RAN4 NR UE feature list*Candidate options:**Recommendations for 2nd round:*Closed, no further discussion needed. |

*Recommendations 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 provides recommendation on CRs/TPs Status update*

|  |  |
| --- | --- |
| **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)

**Sub-topic 4-1 Framework in defining CSSF for RRM/PRS MG sharing**

*Candidate options:*

*Recommendations for 2nd round:*

According to the chairman’s guidance before 2nd round, the tentative agreement from 1st round will be discussed in the GTW, and it is not supposed to be further discussed in the 2nd round.

On the other hand, you can still provide your comments in the 2nd round in case you identify any technical issue in defining CSSF based on existing framework, i.e. option 2 (If measurement of a PRS layer is considered as long periodicity measurement, CSSF for this PRS layer is 1, otherwise this PRS layer would compete for MG with other MG-based RRM measurement).

|  |  |
| --- | --- |
| **Company** | **Comments**  |
|  |  |
|  |  |
|  |  |

**Sub-topic 4-2 Condition of long periodicity PRS measurement**

*Candidate options:*

* Option 1a (HW, OPPO): Tprs \* X \* *dl-prs-MutingBitRepetitionFactor* >=160ms
	+ X is the number of consecutive zeros in *NR-MutingPattern-r16* for *mutingOption1-r16*
* Option 1b (QC, OPPO): max(Tprs \* X \* *dl-prs-MutingBitRepetitionFactor*) >=320ms
	+ X is the length of *NR-MutingPattern-r16* for *mutingOption1-r16*
* Option 1c (Nokia): Tprs \* X >=320ms
	+ X is the size of MutingPattern
* Option 1d (Ericsson): Long-periodicity NR measurements are the measurements with PRS periodicity >160 ms (with or without muting) or equal 160 ms (with muting)
* Option 2 (CATT): Long-periodicity PRS means the PRS periodicity in each frequency layer defined in sub-topic 1-2 is larger than or equal to [320]ms
* Option 3 (Intel): FFS

*Recommendations for 2nd round:*

Continue discussion in the 2nd round and the agreement will be captured in the WF.

Proponents of option 1c and 1d, please clarify whether muting option 1, or option 2, or both are considered. Proponent of option 2, please clarify whether muting is considered or not.

Besides the definition of the long periodicity measurement, following issues are raised up by companies, and they can be discussed in the 2nd round also:

* Issue 1: How to account for the conclusion from sub-topic 1-2.
* Issue 2: whether and how muting should be accounted in the PRS measurement period requirements as captured in TS 38.133 sections 9.9.2, 9.9.3 and 9.9.4

|  |  |
| --- | --- |
| **Company** | **Comments**  |
| Intel | Can be FFS.As we pointed out in 1st round discussion, some parameters in 1a,1b need clarifications.  |
| Ericsson | Option 1d |
| Qualcomm | Suggest we down-select between options 1a and 1b with potential modifications depending on the outcome of sub-topic 1-2. Whether the threshold whould be >160 or >= 320 could also be discussed after we have selected one option.Regarding issue 2 above, our view is that currently the PRS measurement period requirements do not account for muting. They should be modified to account for it or an applicability condition should be added.  |
| Huawei | For defining long periodicity measurement, we are fine to go with option 1a which is simpler than option 1b.For issue 2 above, we think it is a valid issue and we suggest to further discuss it in next meeting.  |
| CATT | Option 2. Our view is the periodicity used in sub-topic 1-2 should be the baseline to define long-periodicity PRS. In my initial view, the muting is not under consideration. That is long-periodicity PRS means the PRS periodicity in each frequency layer is larger than or equal to [320]ms no matter whether the muting is used. But we are fine to further study considering muting.  |

**Sub-topic 4-3 Different resource periodicities in a PRS layer**

*Candidate options:*

* Option 1 (QC, Intel): For position frequency layers, calculate $CSSF\_{PRS,i}$ based on the maximum periodicity across all the PRS resources within each layer and taking into account type1 (inter-period) muting
	+ May be adjusted based on outcome of sub-topic 1-2
* Option 1a (CATT): Follow the same conclusion of sub-topic 1-2
* Option 2 (Ericsson): Not needed. We should take the per-gap approach, as it is in Rel-15.
* Option 3 (ZTE, HW, OPPO): FFS

*Recommendations for 2nd round:*

Continue discussion in the 2nd round and the agreement will be captured in the WF.

|  |  |
| --- | --- |
| **Company** | **Comments**  |
| Intel | Support Option1 |
| ZTE | Option 3, need time to further study. |
| Ericsson | Option 2 or Option 3. Gaps needs to be considered. |
| Qualcomm | This issue may need more discussion. We favor option 1, adjusted based on the outcome of sub-topic 1-2. For option 2, CSSF would be calculated at the PRS resource level? Regarding option 3, if it’s FFS, what would be the assumption in the meantime? |
| Huawei | Option 3.We understand that the issue needs to be made clear, but so far we have no good solution and we need more time to check. For option 1, as we commented in the first round, if the time offsets are different for the two resources (Res1 with 80ms period and Res2 with 320ms) on the same PRS layer, UE will have no opportunity at all to measure Res1.  |
| CATT | Support option 1a.  |

**Sub-topic 4-5 Applicable scenarios for PRS measurement requirements**

*Candidate options:*

* Option 1 (HW, QC, CATT, Intel, OPPO): The measurement requirements do not apply for a PRS resource, if time span of the PRS resource instance is greater than UE reported capability N.
* Option 2 (QC, HW, CATT, OPPO): The measurement requirements do not apply for a PRS resource, if the time span of a DL PRS resource instance is greater than the configured measurement gap length
* Option 3 (HW, Intel, OPPO): 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 4 (Ericsson): none of option 1~3 is needed.

*Recommendations for 2nd round:*

Continue discussion in the 2nd round and the agreement will be captured in the WF.

|  |  |
| --- | --- |
| **Company** | **Comments**  |
| Intel | Support both opt 1 and 3. |
| Ericsson | Options 1 and 2 are not acceptable. Why cannot the UE measure according to its capability, as already clarified in 38.133? PRS configuration is cell-specific, unlike the UE capability and MGRP, which means Options 1 and 2 require the NW to base the PRS configuration on the least capable UE.Option 3 can be FFS. |
| Qualcomm | We favor options 1 and 2. Option 3 should be explained more clearly. What is meant by “across two sampling duration of N”? |
| Huawei  | We support option 1, 2 and 3.Option 3 can be better illustrated in the figure below. As the scaling factor $\left⌈\frac{L\_{PRS,i}}{N}\right⌉$ is 2, UE will take the first N for the first sample, which covers resource 1, and UE will take the second N for the second sample, which covers resource 3. Resource 2 is across two sampling duration of N, and can only be measured in two samples (resource periods). For the similar reason as in option 1, we think no requirement should apply for this resource. |
| CATT | Support option 1 and option 2.  |

## 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**  |
| R4-2017143 | WF on UE PRS measurement requirements*No further agreement in 2nd round.* *Agreement on sub-topic 4-1 was reached during GTW session and will be captured in the WF.**Open issues and possible options are also captured in the WF* |

# Recommendation for Tdocs

After first round:

|  |  |  |  |
| --- | --- | --- | --- |
| Tdoc No. | Source company | Recommendation | Remarks |
| **CR on RSTD** |
| R4-2015751 | Huawei, HiSilicon | Merged |  |
| R4-2016391 | Ericsson | Revised | Please align with other CRs for PRS-RSRP and UE Rx-Tx correctionPlease remove the change to void clause 9.9.2.4.1 9.9.2.4.2 9.9.2.4.3 9.9.2.4.4. As indicated by chair before the meeting, this would be done in CSI-RS WI. |
| R4-2016558 | Qualcomm Incorporated | Merged |  |
| **CR on PRS-RSRP** |
| R4-2015753 | Huawei, HiSilicon | Revised | Please align with other CRs for RSTD and UE Rx-Tx correction |
| R4-2016393 | Ericsson | Merged |  |
| R4-2016557 | Qualcomm Incorporated | Merged  |  |
| R4-2015369 | CATT | Revised | Cover sheet issue:The secretary commented that the CR number 1254 is missing on the coversheet. |
| **CR on UE Rx-Tx** |
| R4-2015755 | Huawei, HiSilicon | Merged |  |
| R4-2016395 | Ericsson | Merged |  |
| R4-2016559 | Qualcomm Incorporated | Merged  |  |
| R4-2016999 | OPPO | Revised | Focus on UE Rx-Tx, so please remove Change 1 and Change 2 in the revisionPlease align with other CRs for RSTD and PRS-RSRP correction |
| **CR on other requirements** |
| R4-2015757 | Huawei, HiSilicon | Merged |  |
| R4-2015758 | Huawei, HiSilicon | Revised | To address comments from Ericsson and Intel |
| R4-2016397 | Ericsson | Merged |  |
| R4-2016556 | Qualcomm Incorporated | Revised | To capture the agreements on requirement applicability |
| R4-2016156 | Nokia | Revised | To capture the agreements on CSSF |
| **LS on new per-UE MG for NR positioning** |
| R4-2014282 | Apple | Approved |  |
| **NewTdoc** |
| XXXX | Huawei, HiSilicon | Return to | Title: WF on UE PRS measurement requirementsTo capture technical agreements and remaining open issues |

After second round:

|  |  |  |  |
| --- | --- | --- | --- |
| Tdoc No. | Source company | Recommendation | Remarks |
| **CR on RSTD** |
| R4-2016391 | Ericsson | Revised to R4-2017144 |  |
| R4-2017144 | Ericsson | Return to | Ericsson and Huawei have different views on* Sections numbers referred for CSSF
* Definition of parameter Lprs
 |
| **CR on PRS-RSRP** |
| R4-2015753 | Huawei, HiSilicon | Revised to R4-2017145 |  |
| R4-2017145 | Huawei, HiSilicon | Return to | Ericsson and Huawei have different views on* Sections numbers referred for CSSF
* Definition of parameter Lprs
 |
| R4-2015369 | CATT | Revised to R4-2017146 |  |
| R4-2017146 | CATT | Agree |  |
| **CR on UE Rx-Tx** |
| R4-2016999 | OPPO | Revised to R4-2017147 |  |
| R4-2017147 | OPPO | Revise | Need to add CR numberEricsson and Huawei have different views on* Sections numbers referred for CSSF
* Definition of parameter Lprs
 |
| **CR on other requirements** |
| R4-2015758 | Huawei, HiSilicon | Revised to R4-2017148 |  |
| R4-2017148 | Huawei, HiSilicon | Postpone |  |
| R4-2016556 | Qualcomm Incorporated | Revised to R4-2017149 |  |
| R4-2017149 | Qualcomm Incorporated | Return to | Not available, can capture possible agreements from GTW |
| R4-2016156 | Nokia | Revised to R4-2017150 | To capture the agreements on CSSF |
| R4-2017150 | Nokia | Return to | Not available (draft shared), can capture possible agreements from GTW |
| **NewTdoc** |
| R4-2017143 | Huawei, HiSilicon | Revise | To include the agreement from GTW |