**3GPP TSG-RAN WG4 Meeting #100-eR4-21xxxxx**

**Electronic Meeting, 16 – 27 August, 2021**

**Agenda item:** 6.1.6.1

**Source:** Moderator (Huawei)

**Title:** Email discussion summary for [100-e][209] NR\_pos\_1

**Document for:** Information

# Introduction

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

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| 6.1.6.1 RRM core requirements maintenance (38.133) [NR\_pos-Core]  6.1.6.1.1 PRS-RSTD measurement requirements [NR\_pos-Core]  6.1.6.1.2 PRS-RSRP measurement requirements [NR\_pos-Core]  6.1.6.1.3 UE Rx-Tx time difference measurement requirements [NR\_pos-Core]  6.1.6.1.4 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
* Pay attention to the rule for shortening file name

# Topic #1: RSTD measurement period

## Companies’ contributions summary

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| **T-doc** | **Company** | **Proposals / Observations** |
| [**R4-2111983**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2111983.zip) | CATT | **Proposal 1: No relation between the observation window of N and observation window of Lavailable\_PRS。**  **Proposal 2: Suggest the following text for the Lavailable\_PRS captured in the specification:**  **“ is the time duration of available PRS to be measured in , and is calculated in the same way as PRS duration K defined in clause 5.1.6.5 of TS 38.214 [26].**   * **For calculating, only the resources unmuted and fully or partially covered by the MG are considered.”**   **Proposal 3: When multiple PFLs are configured, which PFL is assumed measured is up to UE implementation. But the PFL with long periodicity PRS is always prioritized.**  **Proposal 4: Measurement requirements do not apply if some of the PRS resources in the PFL can be measured with periodicity shorter than or equal to 160 ms. i.e. none of the PRS resources in the PFL would be measured.** |
| [**R4-2111985**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2111985.zip) | CATT | CR |
| [**R4-2112540**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112540.zip) | vivo | **Proposal 1: The measurement period requirements when muting option 1 is configured are applicable when there are PRS resources available during min (10240 ms, *Tprs \* dl-PRS-MutingBitRepetitionFactor-r16*)**.  **Proposal 2: No****further enhancement for the case where *Tprs \* dl-PRS-MutingBitRepetitionFactor-r16 \* L < 10240.***  **Proposal 3: When muting option 2 is configured, the measurement accuracy requirements may not be met if the least number of repetitions defined in accuracy requirements cannot be ensured.**  **Proposal 4: Relation between the observation windows of Lavailable\_PRS** **and UE processing capability ‘N’ has already taken into account in the existing measurement period requirements.**  **Proposal 5: If MG pattern is reconfigured during measurement period, the UE shall continue and complete the on-going RSTD measurements with updated MG pattern. No measurement period requirements for reconfiguration are specified.** |
| [**R4-2112563**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112563.zip) | vivo | CR |
| [**R4-2113153**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2113153.zip) | Intel Corporation | ***Proposal 1: The measurement period defined in [2] can be applicable for PRS configuration cases with muting Option 2***  ***Proposal 2: Measurement requirements do not apply if some of the PRS resources in the PFL can be measured with periodicity shorter or equal to 160 ms. i.e. none of the PRS resources in the PFL would be measured.*** |
| [**R4-2113257**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2113257.zip) | OPPO | **Proposal 1: Requirement applicability for PRS muting pattern is not necessary and network should guarantee that each PRS resource configured to the UE is available for measurement.**  **Proposal 2: Do not discuss further enhancement when Tprs\*L\**dl-PRS-MutingBitRepetitionFactor-r16*<10240ms, and keep the current agreements in this release.**  **Proposal 3: Do not introduce additional clarification for muting option 2.**  **Proposal 4: There is no relation between the observation windows Lavailable\_PRS,i and window T.** |
| [**R4-2113258**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2113258.zip) | OPPO | CR |
| [**R4-2114193**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114193.zip) | Qualcomm Incorporated | **Proposal 1: Clarify in TS 38.133 that Rel-16 PRS-based measurements are supported with per-UE measurement gaps only. Tables 9.1.2-2 and 9.1.2-3 would be modified to exclude the applicability of per-FR measurement gaps for positioning measurements. Applicability conditions for positioning measurements in sec 9.9.1 would explicitly mention per-UE measurement gaps.** |
| [**R4-2114233**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114233.zip) | Nokia, Nokia Shanghai Bell | Observation 1 : The two windows of *P* and *T* are related to measurement period, especially when T > Tavailable\_PRS,i, . The option-2 “no relation between the two observation windows” is incorrect.  Observation 2 : If a UE processing time *T* exceeds *P* *(* T > Tavailable\_PRS,i), some of allocated PRS resources in every Tms cannot be measured. It is not clear if the missed PRS resource is included in the set of measurement PRS resource slots or not.  Observation 3 : Although we share the problem statement in observation-1 and -2, this issue is close to measurement period optimization issue as enhancement.  Proposal 1 : We agree to keep the current settings of without any change in Rel-16.   - Further enhancement related to the observation window and UE processing capability are discussed in Rel-17. |
| [**R4-2114269**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114269.zip) | Huawei, HiSilicon | **Proposal 1: Muting requirements apply for a resource provided that the first bits of the muting pattern for the resource is not all-zero.**  **Proposal 2: Do not introduce further enhancement to muting requirements in Rel-16.**  **Proposal 3: Do not introduce additional clarification regarding option 2 muting.**  **Proposal 4: Confirm the observation window of Lprs is Tavailable\_PRS,i, and do not introduce additional scaling factor to current requirements.**  **Proposal 5: Clarify the definition of Lprs:**  **is the time duration of PRS resources to be measured in the positioning frequency layer i that fall within MGs and are not muted over the time period Tavailable\_PRS,i, and is calculated in the same way as PRS duration K defined in clause 5.1.6.5 of TS 38.214 [26]**  **Proposal 6: Clarify that the requirements do not apply if PRS configuration exceeds any of the UE capabilities in *NR-DL-PRS-ResourcesCapability*.** |
| [**R4-2114270**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114270.zip) | Huawei, HiSilicon | CR |

## Open issues summary

*Proposal 3&4 from CATT R4-2111983, Proposal 1 from QC R4-2114193, and Proposal 2 from Intel R4-2113153 are treated in Topic #4.*

### Sub-topic 1-1: Remaining issues with PRS muting

#### Issue 1-1-1: Applicability condition for option-1 muting

* Proposals
  + Option 1a (vivo)
    - Define Applicability condition for option-1 muting:
      * The measurement period requirements when muting option 1 is configured are applicable when there are PRS resources available during min (10240 ms, Tprs \* dl-PRS-MutingBitRepetitionFactor-r16).
  + Option 1b (HW)
    - Define Applicability condition for option-1 muting:
      * The requirements apply provided that
        + none of the PRS resource instances is muted in case ; or
        + the first bits of is not all-zero in case
  + Option 2 (OPPO)
    - Requirement applicability for PRS muting pattern is not necessary and network should guarantee that each PRS resource configured to the UE is available for measurement.
* Recommended WF
  + Further discuss

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| **Company** | **Comments** |
| Qualcomm | It would be better to agree on a general applicability condition such as option 1 under issue 1-1-4. |
| vivo | Support option 1. From UE measurement perspective, the measurement requirements can be met if there is available PRS resources. It is up to NW configuration to ensure the availability of PRS resources. |
| Intel | We share view as Qualcomm to agree the general rules for such applicability conditions . |
| Huawei | Option 1b.  We suggest to make the applicability condition clear. E.g. we agreed that N\_muting = 1 if , and in this case UE is not supposed to meet the requirement if any resource occasion is muted.  On option 1a, the condition is more restrictive than necessary. E.g. if Tprs \* dl-PRS-MutingBitRepetitionFactor-r16 = 160ms, it means at least one resource occasion needs to be available in 160ms, but this is not necessary with N\_muting factor.  On option 2, we are not sure what happens if network does not guarantee that each PRS resource configured to the UE is available for measurement. Does the UE still need to meet the requirements?  On the generic applicability condition, we are fine if RAN4 can identify such conditions, but the proposal in option 1 of issue 1-1-4 is too broad in our view, which imposes unnecessary restrictions. We will provide more comments in issue 1-1-4. |
| OPPO | We are fine with both options with slight preference to option 2. If the first bits of is all-zero, the PRS resource will not be transmitted by the gNB at all. It is not a good choice to configured a UE with such the PRS, which is invalid from the perspective of both gNB and UE. Network should check PRS configuration and guarantee each PRS resource configured to UE is transmitted. But if companies do have concerns that network cannot guarantee the PRS configuration is always valid and the clarification is needed for this scenario, then we agree that the requirements should not apply. |
| Nokia | We are fine with option-1b. Since the muting pattern cycle can be longer than 10240ms, it is good to capture the applicability in the spec. |

#### Issue 1-1-2: Enhancement for the case

* Proposals
  + Option 1 (vivo, OPPO, HW, QC)
    - No further enhancement for the case where Tprs \* dl-PRS-MutingBitRepetitionFactor-r16 \* L < 10240.
* Recommended WF
  + It seems all contributing companies suggest no further enhancement, so moderator suggests to agree on the following statement:
    - No further enhancement on the requirements for the case where Tprs \* dl-PRS-MutingBitRepetitionFactor-r16 \* L < 10240 would be introduced in Rel-16.
  + Discuss if the Recommended WF is agreeable or not.

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| **Company** | **Comments** |
| CATT | Fine with the recommended WF. |
| Qualcomm | Support recommended WF. |
| Vivo | Support the recommended WF. |
| Intel | Support the recommended WF. |
| Huawei | Support the recommended WF. |
| OPPO | Support with the recommended WF. |

#### Issue 1-1-3: Considration of muting option-2

* Proposals
  + Option 1 (vivo)
    - When muting option 2 is configured, the measurement accuracy requirements may not be met if the least number of repetitions defined in accuracy requirements cannot be ensured.
  + Option 2 (OPPO, Intel, HW, QC)
    - Do not introduce additional clarification for muting option 2.
* Recommended WF
  + Further discuss

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| **Company** | **Comments** |
| CATT | Our understanding for option 2 is that the current requirements are also applied for muting option 2. Based on this understanding, we are fine with option 2. |
| Qualcomm | Option 2 |
| vivo | Some of the accuracy requirements are defined if number of repetitions is no less than 4 for 24 PRS PRBs. Muting option 2, if configured incorrectly, may results in there is not enough number of repetitions for UE to measure. In this case, at least accuracy requirements may not be met by UE.  We are fine not to add any further clarification for muting option 2 in measurement period core requirements. But we would like to see companies’ views on whether clarification/applicability is needed for accuracy requirements for muting option 2. |
| Intel | Option 2. |
| Huawei | We agree with vivo’s observation, and we are open to discuss the possible clarification to the accuracy part.  One issue in the core part we found based on vivo’s comment is that, we have agreed that a resource is considered to be overlapped with MG if minimum number of repetitions is covered by MGL. As muting option 2 may cause some repetition muted, we think it may be necessary to clarify as “minimum number of unmuted repetitions is covered by MGL”. |
| OPPO | Option 2. |
| Nokia | Option-2 |

#### Issue 1-1-4: General applicability with PRS muting

* Proposals
  + Option 1 (QC)
    - When all the resources from a PRS resource set or PFL are muted, then that PRS resource set or PFL can be ignored for the purpose of the measurement requirements.
    - Measurement requirements do not apply to any PRS resources that are muted, they are not transmitted by the TRP and cannot be measured by the UE.
* Recommended WF
  + Further discuss

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| **Company** | **Comments** |
| CATT | In our understanding, this has been included in the current requirements. It has already been clarified only the unmuted resources will be considered when defining the requirements. |
| Qualcomm | Option 1. If this is well understood and agreed, then we don’t think it will be necessary to discuss so many individual scenarios. |
| Vivo | For the first bullet, we think this would be straightforward that if there is no PRS resources to measure on a PFL, then requirements don’t apply. It seems not necessary to have this in the spec.  For the second bullet, we don’t think this needs to be further clarified. The measurement requirements apply to any PFLs rather for some PRS resources. |
| Intel | For second bullet of Option 1, we have same concerns as vivo since the requirements defined in TS38.133 is for a PFL instead of PRS resource. |
| Ericsson | We also agree with Vivo and Intel that 2nd bullet is confusing because measurement requirements are not specified for specific PRS resources. |
| Huawei | On the first bullet, we have same comment as CATT that this is already reflected in the current requirements.  On the second bullet, we think it is too broad and can be interpreted as no requirement apply if any muting is configured (even it is a valid configuration which can be accounted by the N\_muting factor). |
| OPPO | Generally fine with option 1 to not apply requirements. But we have the same view as commented in issue 1-1-1 that why a PRS resource set or PFL will be configured to a UE if they all not transmitted by the network. |
| Nokia | The first bullet seems like obvious view. We are fine with it, perhaps too obvious to be captured in the spec.  The second bullet is fine with us. |

### Sub-topic 1-2: Parameter

#### Issue 1-2-1: Observation window

* Proposals
  + Option 1a (CATT, OPPO)
    - No relation between the observation window of N and observation window of
  + Option 1b (vivo, HW)
    - Relation between the observation windows of Lavailable\_PRS and UE processing capability ‘N’ has already taken into account in the existing measurement period requirements
  + Option 2 (Nokia)
    - We agree to keep the current settings of without any change in Rel-16.
    - Further enhancement related to the observation window and UE processing capability are discussed in Rel-17
* Recommended WF
  + 4 companies (CATT, OPPO, vivo, HW) suggest that there is no relation between the two observation windows, or the relation is already considered in the current requirements, so suggest no change to the current requirements.
  + 1 company (Nokia) suggests that there is some relation between the two observation windows, and some additional scaling to the current requirements may be needed, but agrees to keep the current requirements and further discuss in Rel-17
  + Based on the status, moderator suggests to agree on the following statement and close the issue for Rel-16:
    - No update to requirements for the relation between observation window of and observation window of capability N would be introduced in Rel-16
  + Discuss if the Recommended WF is agreeable or not.

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| **Company** | **Comments** |
| CATT | Fine with the recommended WF. |
| Qualcoom | Support the recommended WF. |
| vivo | Support the recommended WF. |
| Intel | Support the recommended WF. |
| Ericsson | Support the recommended WF. |
| Huawei | Support the recommended WF. |
| OPPO | Agree with the recommended WF. |
| Nokia | Agree to the recommended WF, but it is strict to make it green.   * No update to requirements for the relation between observation window of and observation window of capability N would be introduced in Rel-16, unless further enhancement is identified. |

#### Issue 1-2-1: Update to the definition of

* Proposals
  + Option 1a (CATT)
    - is the time duration of available PRS to be measured in , and is calculated in the same way as PRS duration K defined in clause 5.1.6.5 of TS 38.214 [26].
      * For calculating, only the resources unmuted and fully or partially covered by the MG are considered.
  + Option 1b (HW)
    - is the time duration of PRS resources to be measured in the positioning frequency layer i that fall within MGs and are not muted over the time period Tavailable\_PRS,i, and is calculated in the same way as PRS duration K defined in clause 5.1.6.5 of TS 38.214 [26]
* Recommended WF
  + The two options are rather similar, so moderators suggests to agree on the following updated definition of based on a merge between them:
    - is the time duration of available PRS in the positioning frequency layer i to be measured in , and is calculated in the same way as PRS duration K defined in clause 5.1.6.5 of TS 38.214 [26].
      * For calculating, only the resources unmuted and fully or partially covered by the MG are considered.
  + Discuss if the Recommended WF is agreeable or not.

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| **Company** | **Comments** |
| CATT | Fine with the recommended WF. |
| Qualcomm | We would support the following modified version of option 1b, clarifying what “fall within MG” means:  is the time duration of PRS resources to be measured in the positioning frequency layer i that are fully covered by MGs and are not muted over the time period Tavailable\_PRS,i, and is calculated in the same way as PRS duration K defined in clause 5.1.6.5 of TS 38.214 [26]  Where “fully covered by MG” would be defined by option 2 in issue 2-2-1. It could be clarified that the definition applies to PRS resource instances. |
| vivo | Fine with the recommended WF. |
| Intel | Support the recommended WF. |
| Ericsson | Support the recommended WF. |
| Huawei | Support the recommended WF.  To QC, we think that the definition discussed in issue 2-2-1 is generic and also applies to the calculation of , so we prefer to use the wording in the recommended WF (from CATT) and no specific clarification on “fully or partially covered by the MG” for calculation of is needed. |
| OPPO | Support the recommended WF. |
| Nokia | Support the recommended WF. |

### Sub-topic 1-3: Others

#### Issue 1-3-1: Impact of MG reconfiguration

* Proposals
  + Option 1 (vivo)
    - If MG pattern is reconfigured during measurement period, the UE shall continue and complete the on-going RSTD measurements with updated MG pattern. No measurement period requirements for reconfiguration are specified..
* Recommended WF
  + In RAN4#99-e, the following was agreed in WF R4-2108294, and it seems option 1 is a bit different from the agreement.

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| * MG reconfiguration per UE request   + RAN4 does not specify the exact measurement period extension due to MG reconfiguration during the measurement period   + Add the following text to TS 38.133 sections 9.9.2.5, 9.9.3.5 and 9.9.4.5:     - If during the measurement period of one or more positioning frequency layers, the MG pattern is reconfigured, the measurement period can be longer.   + For MG reconfiguration during measurement period not per UE request, apply same requirements as MG reconfiguration based on UE request. |

* + Further discuss whether to adopt option 1 or keep the existing agreement.

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| **Company** | **Comments** |
| CATT | Suggest keeping the existing agreement. |
| Qualcomm | The existing agreement seems sufficient. |
| Vivo | We think there is value to specify UE behavior as for other cases, e.g., HO, cell change etc. If MG periodicity after reconfiguration is shorter, the entire measurement period could be shorter either. The existing requirements do not cover the case and it is not very clear what measurement period means exactly, e.g., measurement period during transition or measurement period after reconfiguration. Our view is that no measurement period requirements are specified and only UE behavior is clarified. |
| Intel | Kept the existing requirements. |
| Ericsson | Support the existing requirements in RAN4#99-e. |
| Huawei | Suggest keeping the existing agreement.  To vivo, we understand if no measurement period requirement is defined, then there is no need to specify the UE behaviors. We think the existing agreement is sufficient for Rel-16, and if this is seen as important scenario to address, we are open to discuss it in Rel-17. |
| OPPO | Keep the existing agreement. |
| Nokia | The existing agreement seems sufficient. |

#### Issue 1-3-2: Applicability condition on measurement capability

* Proposals
  + Option 1 (HW)
    - Clarify that the requirements do not apply if PRS configuration exceeds any of the UE capabilities in *NR-DL-PRS-ResourcesCapability*
* Recommended WF
  + Further discuss

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| **Company** | **Comments** |
| CATT | Fine with option 1. |
| Intel | Option 1 |
| Ericsson | Option 1 is ok. |
| Huawei | Option 1 |
| Qualcomm2 | In case the assistance data exceeds the *NR-DL-PRS-ResourcesCapability*, the UE should process PRS resources up to its capability. As to which resources should be processed by the UE, it can be left up to implementation where there is no pre-defined priority in the assistance data. E.g. PFLs are not prioritized in the assistance data. |
| OPPO | Option 1. |
| Nokia | We agree with QC. This can be requirement applicability per PFL. Does it need to be requirement per UE? |

## Companies views’ collection for 1st round

### Open issues

### CRs/TPs comments collection

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| **CR/TP number** | **Comments collection** |
| R4-2111985 (CATT) | Intel: Can be merged with R4-2112563, R4-2113258, R4-2114270 |
| Qualcomm2: Suggested changes uploaded. |
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| R4-2112563 (vivo) | Qualcomm2: Pending issue 1-3-1. |
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| R4-2113258 (OPPO) | Qualcomm2: Suggested changes uploaded. |
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| R4-2114270 (HW) | Qualcomm2: Suggested changes uploaded. |
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## Summary for 1st round

### Open issues

#### Sub-topic 1-1: Remaining issues with PRS muting

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| Issue 1-1-1: Applicability condition for option-1 muting *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:*  Close the issue and discuss the necessary applicability condition of the muting requirements in Issue 1-1-4. |
| Issue 1-1-2: Enhancement for the case *Tentative agreements:*  No further enhancement on the requirements for the case where Tprs \* dl-PRS-MutingBitRepetitionFactor-r16 \* L < 10240 would be introduced in Rel-16.  *Candidate options:*  *Recommendations for 2nd round:*  None |
| Issue 1-1-3: Consideration of muting option-2 *Tentative agreements:*  Do not introduce additional clarification for muting option 2 in the measurement period requirements.  *Candidate options:*   * + Option 1 (vivo)     - Discuss whether clarification/applicability is needed for accuracy requirements for muting option 2   + Option 2 (HW)     - Definition of PRS resource being overlapped with MG should be based on “minimum number of unmuted repetitions is covered by MGL”.   *Recommendations for 2nd round:*  Further discuss the options, the two options are not exclusive. |
| Issue 1-1-4: General applicability with PRS muting *Tentative agreements:*  *Candidate options:*   * + Option 1 (vivo)     - Define Applicability condition for option-1 muting:       * The measurement period requirements when muting option 1 is configured are applicable when there are PRS resources available during min (10240 ms, Tprs \* dl-PRS-MutingBitRepetitionFactor-r16).   + Option 2 (HW, Nokia)     - Define Applicability condition for option-1 muting:       * The requirements apply provided that         + none of the PRS resource instances is muted in case ; or         + the first bits of is not all-zero in case   + Option 3 (QC)     - When all the resources from a PRS resource set or PFL are muted, then that PRS resource set or PFL can be ignored for the purpose of the measurement requirements.     - Measurement requirements do not apply to any PRS resources that are muted, they are not transmitted by the TRP and cannot be measured by the UE.   *Recommendations for 2nd round:*  Further discuss the options. |

#### Sub-topic 1-2: Parameter

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| Issue 1-2-1: Observation window *Tentative agreements:*  No update to requirements for the relation between observation window of and observation window of capability N would be introduced in Rel-16, unless further enhancement is identified.  *Candidate options:*  *Recommendations for 2nd round:*  None |
| Issue 1-2-2: Update to the definition of *Tentative agreements:*   * is the time duration of available PRS in the positioning frequency layer i to be measured in , and is calculated in the same way as PRS duration K defined in clause 5.1.6.5 of TS 38.214 [26].   + For calculating, only the resources unmuted and fully or partially overlapped with MG are considered.   *Candidate options:*  *Recommendations for 2nd round:*  Further discuss if the tentative agreement is agreeable.  Note that compared to the recommended WF, “covered by the MG” is changed to “overlapped with MG”. This is based on QC comments in issue 2-2-1 about terminology alignment, and moderator suggests to use “overlapped with MG” as it is already used in clause 9.9.1. |

#### Sub-topic 1-3: Others

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| Issue 1-3-1: Impact of MG reconfiguration *Tentative agreements:*  *Candidate options:*   * + Option 1 (vivo)     - If MG pattern is reconfigured during measurement period, the UE shall continue and complete the on-going RSTD measurements with updated MG pattern. No measurement period requirements for reconfiguration are specified.   + Option 2 (CATT, QC, Intel, Ericsson, HW, OPPO, Nokia)     - Keep the existing agreement from RAN4#99-e, and no further agreement is needed   *Recommendations for 2nd round:*  Further discuss. |
| Issue 1-3-2: Applicability condition on measurement capability *Tentative agreements:*  *Candidate options:*   * + Option 1 (HW, CATT, Intel, Ericsson, OPPO)     - Clarify that the requirements do not apply if PRS configuration exceeds any of the UE capabilities in *NR-DL-PRS-ResourcesCapability*   + Option 2 (QC, Nokia)     - FFS   *Recommendations for 2nd round:*  Further discuss.  @QC/Nokia, could you please clarify if you are fine with option 1 or not? The question is: in case the assistance data exceeds the NR-DL-PRS-ResourcesCapability, is the UE expected to meet the current requirements or not? |

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

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

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

# Topic #2: Other issues

## Companies’ contributions summary

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| **T-doc** | **Company** | **Proposals / Observations** |
| [**R4-2111987**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2111987.zip) | CATT | CR |
| [**R4-2112543**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112543.zip) | vivo | **Proposal 1: When multiple PFLs are configured, the PFL under measurement for positioning is assumed for CCSF calculation for an RRM frequency layer.**  **Proposal 2: CCSF calculation for an RRM frequency layer is the same as Rel-15 by assuming the PFL under measurement as the candidate positioning frequency layer.**  **Proposal 3: Long periodicity measurement requirements apply even if some of the PRS resources in the PFL can be measured with periodicity shorter or equal to 160ms.**  **Proposal 4: If at least part of a PRS resource, including at least the minimum number of repetitions specified in the accuracy requirements, is fully covered by MGL excluding RF switching time, then the PRS resource is considered being fully covered by MGL.**  **Proposal 5: If the search window defined by *nr-DL-PRS-ExpectedRSTD* and *nr-DL-PRS-ExpectedRSTD-Uncertainty* together is not covered by MGL, the UE is supposed to do PRS measurement within the entire MGL.** |
| [**R4-2112569**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112569.zip) | vivo | CR |
| [**R4-2113263**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2113263.zip) | OPPO | **Proposal 1: Support option 2: long-periodicity measurement requirements do not apply if some of the PRS resources in the PFL can be measured with periodicity shorter or equal to 160ms.**  **Proposal 2: Further discuss the following methods to calculate the CSSF for an RRM layer when multiple PFLs are configured:**   * **Use the maximum of intermediate CSSF(i) values and each of the intermediate CSSF(i) is calculated assuming that PFL-i and all RRM layers are being measured.** * **Calculate the CSSF for RRM frequency layers assuming the merged PFL is measured**   **Proposal 3: A PRS resource is overlapped with MG if the minimum number of repetitions specified in the accuracy requirements are covered by the MGL excluding RF switching time.**  **Proposal 4: The measurement delay and accuracy requirements do not apply for a PRS resource not overlapped with MG.**  **Proposal 5: For the calculation of CSSF, a PFL should be excluded if none of PRS resources in this PFL are overlapped with MG.** |
| [**R4-2114065**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114065.zip) | Nokia, Nokia Shanghai Bell | 1. The statement ‘When multiple PFLs are configured by the LMF, the order of measurement and processing of the PFLs is up to UE implementation’ needs to be specified in TS 38.133. 2. When multiple PFLs are configured by the LMF, CSSF for an RRM frequency layer MO *i* is determined by:   a) excluding MG occasions for long periodicity measurements for which no RRM frequency layers need to be measured;  b) adjusting for the remaining MG occasions the ratio Ri accordingly for RRM frequency layer MO *i*;  c) defining Mintra and Minter MO candidates for these remaining MG occasions, applying, depending on MG sharing scheme, coefficients Kintra and Kinter, thereby accounting for maximum one PFL contributing to Minter, which does not qualify for a long periodicity measurement, as MO candidate per MG occasion and  d) selecting the maximum out of these remaining MG occasions.   1. Regarding long periodicity measurement, we support option 2, i.e. measurement requirements do not apply if some of the PRS resources in the PFL can be measured with periodicity shorter or equal to 160 ms. 2. Add a definition of the term ‘PRS resource instance’ in TS 38.133. |
| [**R4-2114066**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114066.zip) | Nokia, Nokia Shanghai Bell | CR |
| [**R4-2114195**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114195.zip) | Qualcomm Incorporated | **Observation 1: In the extreme (corner) case in which all the resources within a PRS resource set or PFL are muted, then that PRS resource set or PFL can be ignored for the purpose of the measurement requirements.**  **Observation 2: Overestimation of N\_muting can be avoided by the network by configuring a muting bitmap of the minimum possible length so that the muting pattern does not repeat within the bitmap.**  **Proposal 1: The starting point for the PRS-RSTD measurement period should be as follows: “The time *s*tarts from the first MG instance aligned with a DL PRS resource(s) in the assistance data after both the *NR-TDOA-ProvideAssistanceData* message and *NR-TDOA-RequestLocationInformation* message are delivered from LMF to the physical layer of UE via LPP [34].”**  **Proposal 2: The starting point for the PRS-RSRP measurement period should be as follows: “When PRS-RSRP measurements are configured for DL-AoD, the time starts from the first MG instance aligned with DL PRS resources in the assistance data after both the *NR-DL-AoD-RequestLocationInformation* message and *NR-DL-AoD-ProvideAssistanceData* message from LMF via LPP [34] are delivered to the physical layer of UE.”**  **Proposal 3:** **The starting point for the UE Rx-Tx measurement period should be as follows:** **“The time starts from the first MG instance aligned with DL PRS resources in the assistance data after both the *NR-Multi-RTT-RequestLocationInformation* message and *NR-Multi-RTT-ProvideAssistanceData* message from LMF via LPP [34] are delivered to the physical layer of UE.”**  **Proposal 4: The current measurement period requirement is directly proportional to . No further adjustment is needed to account for the ratio .**  **Proposal 5: When multiple PFLs are configured,CSSF within gap would be calculated as follows:**   1. **Let M be the number of PFLs configured by the LMF. M iterations are performed to calculate the final CSSF within gap for RRM measurements and PFLs.** 2. **In each iteration select one of the M PFLs and calculate CSSF within gap as agreed by RAN4 for the case of a single PFL.** 3. **Repeat step b M times, each time selecting a different PFL.** 4. **After all the iterations are completed, we have M values of for each RRM measurement object and M values for PFLs.** 5. **For each measurement object set to the maximum of the M values is step d. For all the PFLs set to the maximum of the M values calculated in step d.**   **Proposal 6: Measurement requirements do not apply if some of the PRS resources in the PFL can be measured with periodicity shorter or equal to 160 ms. i.e. none of the PRS resources in the PFL would be measured.**  **Proposal 7: A PRS resource is considered to be “fully covered by the MG”** **if at least the minimum number of repetitions specified in the accuracy requirements are covered by the MGL excluding RF switching time.**  **Proposal 8: Measurement requirements apply only for PRS resources that are “fully covered by the MG.”** |
| [**R4-2114278**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114278.zip) | Huawei, HiSilicon | **Proposal 1: For defining CSSF for an RRM frequency layer,**   * **N intermediate CSSF values would be calculated, where N is the number of PFLs and each intermediate CSSF value accounts for only one of the PFLs.** * **The CSSF value for the RRM frequency layer is the highest one among the N intermediate CSSF values.**   **Proposal 2: Measurement requirements do not apply if some of the PRS resources in a PFL with Tavailable\_PRS,i > 160ms can be measured with periodicity <= 160ms.**  **Proposal 3: Take into account expected RSTD and expected RSTD uncertainty in defining overlap between PRS resource and MG.** |
| [**R4-2114279**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114279.zip) | Huawei, HiSilicon | CR |

## Open issues summary

*QC CR R4-2114205 is treated in this topic. Observation 1&2 and Proposal 4 of QC R4-2114195 are treated under Topic #1.*

### Sub-topic 2-1 CSSF

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

* Proposals
  + Option 1 (vivo)
    - When multiple PFLs are configured, the PFL under measurement for positioning is assumed for CCSF calculation for an RRM frequency layer.
    - CCSF calculation for an RRM frequency layer is the same as Rel-15 by assuming the PFL under measurement as the candidate positioning frequency layer.
  + Option 2a (OPPO, HW)
    - For defining CSSF for an RRM frequency layer,
      * N intermediate CSSF values would be calculated, where N is the number of PFLs and each intermediate CSSF value accounts for only one of the PFLs.
      * The CSSF value for the RRM frequency layer is the highest one among the N intermediate CSSF values.
  + Option 2b (QC)
    - When multiple PFLs are configured, CSSF within gap would be calculated as follows:
      * Let M be the number of PFLs configured by the LMF. M iterations are performed to calculate the final CSSF within gap for RRM measurements and PFLs.
      * In each iteration select one of the M PFLs and calculate CSSF within gap as agreed by RAN4 for the case of a single PFL.
      * Repeat step b M times, each time selecting a different PFL.
      * After all the iterations are completed, we have M values of for each RRM measurement object and M values for PFLs.
      * For each measurement object set to the maximum of the M values is step d. For all the PFLs set to the maximum of the M values calculated in step d.
  + Option 3a (OPPO)
    - Calculate the CSSF for RRM frequency layers assuming the merged (short periodicity) PFL is measured.
  + Option 3b (Nokia)
    - The statement ‘When multiple PFLs are configured by the LMF, the order of measurement and processing of the PFLs is up to UE implementation’ needs to be specified in TS 38.133.
    - When multiple PFLs are configured by the LMF, CSSF for an RRM frequency layer MO i is determined by:
      * a) excluding MG occasions for long periodicity measurements for which no RRM frequency layers need to be measured;
      * b) adjusting for the remaining MG occasions the ratio Ri accordingly for RRM frequency layer MO i;
      * c) defining Mintra and Minter MO candidates for these remaining MG occasions, applying, depending on MG sharing scheme, coefficients Kintra and Kinter, thereby accounting for maximum one PFL contributing to Minter, which does not qualify for a long periodicity measurement, as MO candidate per MG occasion and
      * d) selecting the maximum out of these remaining MG occasions.
* Recommended WF
  + Further discuss
  + The difference between option 2a and 2b is that in option 2a the ‘max’ approach is only used to derive CSSF for RRM, while in option 2b it is also used to derive CSSF for PFL
  + The difference between option 3a and 3b is that in option 3a the ‘merge’ is only among short periodicity PFLs, while in option 3b it is also among all PFLs

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| **Company** | **Comments** |
| Qualcomm | Option 2a (preferred) or 2b. |
| vivo | Option 1. It is to some extent aligned with that measurement period requirements are defined based on summation-based approach. |
| Huawei | Option 2a.  On option 1, the suggested “PFL under measurement” is still unclear because which PLF to measure for a particular MG occasion should be up to UE implementation.  On option 3, the requirements will be unnecessarily relaxed with the ‘merged’ approach. |

#### Issue 2-1-2: Requirement applicability for long periodicity measurement

* Proposals
  + Option 1 (CATT, Intel, OPPO, Nokia, QC, HW)
    - Measurement requirements do not apply if some of the PRS resources in the PFL can be measured with periodicity shorter than or equal to 160 ms. i.e. none of the PRS resources in the PFL would be measured.
  + Option 2 (vivo)
    - Long periodicity measurement requirements apply even if some of the PRS resources in the PFL can be measured with periodicity shorter or equal to 160ms
* Recommended WF
  + Further discuss

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| **Company** | **Comments** |
| CATT | Support option 1. It is too restricted for RRM measurement if we take all the resources as highest priority in the PFL which includes only few long periodicity resources. |
| Qualcomm | Option 1. |
| vivo | Option 2.  In existing requirements as below, the periodicity of a PFL is LCM of all periodicities of all PRS resources on the PFL. The measurement requirements period requirements are specified per PFL/ total PFLs rather than per PRS resource. Even if some PRS resources are configured with shorter periodicity less than 160ms, the periodicity of the PFL is still larger than 160ms and the PFL should be considered as long periodicity measurement.  If more than one PRS periodicities are configured in positioning frequency layer *i*, the least common multiple of PRS periodicities among all DL PRS resource sets in the positioning frequency layer is used to derive the measurement period of that positioning frequency layer *i*. |
| Intel | Option 1 |
| Ericsson | We support option 2. Option 1 is limitation on NW to not configure shorter PRS resource period than 160 ms. The UE should meet the requirements for 160 ms PRS periodicity. This is the same approach for SMTC which can be as short as 5 ms, but there is min period based on 40 ms SMTC. |
| Huawei | Option 1.  To vivo, we agree that the periodicity of the PFL is still larger than 160ms and the PFL should be considered as long periodicity measurement, but the problem is that the resources with short periodicity will also be measured with CSSF=1 and thus blocking RRM measurement, so intention of option 1 is to discourage NW to make such configuration.  To Ericsson, NW can configure PRS resource period < 160 ms, but what is intended by option 1 is NW should not configure some PRS resource period < 160 ms and some > 160ms for the same PFL as it will cause issue to RRM measurement |
| Nokia | Option-1 |

### Sub-topic 2-2 PRS resource being overlapped with MG

#### Issue 2-2-1: Definition

* Proposals
  + Option 1 (vivo)
    - If at least part of a PRS resource, including at least the minimum number of repetitions specified in the accuracy requirements, is fully covered by MGL excluding RF switching time, then the PRS resource is considered being fully covered by MGL.
  + Option 2 (OPPO, QC)
    - A PRS resource is overlapped with MG if the minimum number of repetitions specified in the accuracy requirements are covered by the MGL excluding RF switching time.
  + Option 3a (HW)
    - A PRS resource is considered to be fully (partially) overlapped with MG if all (some) of its instances are overlapped with an MG occasion.
    - A PRS resource instance is considered to be overlapped with an MG occasion if the minimum number of repetitions of the instance is fully covered by the MGL excluding RF switching time, where the minimum number is given in the accuracy requirements.
  + Option 3b (Nokia)
    - Add a definition of the term ‘PRS resource instance’ in TS 38.133.
* Recommended WF
  + It seems all 3 options are technically aligned.
  + Based on HW R4-2114278, what is additionally considered in option 3 is the case where PRS periodicity is smaller than MGRP, and not all PRS resource occasions/instances are covered by MGL excluding RF switching time
  + Further discuss

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| **Company** | **Comments** |
| CATT | The options are technically aligned. For the description, slightly prefer option 2. For option 3, it seems the definition of PRS resource instance is not clear. In our understanding, the instance is the minimum unit that to be repeated in a PRS resource, so there is no repetition in a PRS resource instance. And in our understanding, whether a PRS instance is overlapped with an MG occasion is symbol level and not location level so not related to repetition. |
| Qualcomm | Option 2. RAN4 may want to use the term “fully covered within MG” since that has been used in previous agreements and it is not defined currently. If not, we suggest amending the previous agreements to say “overlapped with MG.” |
| vivo | Option 1.  The existing requirements already specified the overlapping case, which are copied as below.  *A PRS resource instance is considered to be overlapped with measurement gap occasion if the minimum number of repetitions of the instance is fully covered by the MGL excluding RF switching time, where the minimum number is given in the accuracy requirements in clause 10.1.23, 10.1.24 and 10.1.25 for RSTD, PRS-RSRP and UE Rx-Tx time difference, respectively* |
| Huawei | We also think all the 3 options are technically aligned. We would like to check with companies if there is any concern with the current wording in 9.9.1. If not, maybe we can close the issue.  To CATT, we understand that e.g. with PRS resource period 160ms, we will have one resource instance every 160ms, and for each resource instance there can be multiple repetitions  To QC, we agree that RAN4 should use aligned term, either “overlapped with MG” or “fully covered within MG” or “fully covered by the MGL excluding RF switching time”. Our preference is “overlapped with MG”. |
| OPPO | Agree that the 3 options are aligned and our preference is option 2. The word “partial/fully” may be confusing and RAN4 will introduce the definitions based on the **number of configured PRS repetitions(N1)**, the minimum number of PRS repetitions defined in accuracy part(N2), and the actual number of PRS repetition covered by MGL excluding RF(N3). However, the accuracy could be met as long as N3 >= N2, and number of configured PRS repetitions (N1) is not important and so the word “partial / fully” is not need. |

#### Issue 2-2-2: Consideration of RSTD search window

* Proposals
  + Option 1 (vivo)
    - If the search window defined by *nr-DL-PRS-ExpectedRSTD* and *nr-DL-PRS-ExpectedRSTD-Uncertainty* together is not covered by MGL, the UE is supposed to do PRS measurement within the entire MGL.
  + Option 2 (HW)
    - Take into account expected RSTD and expected RSTD uncertainty in defining overlap between PRS resource and MG.
* Recommended WF
  + Further discuss

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| **Company** | **Comments** |
| CATT | Fine with option 1. |
| Qualcomm | Option 2. We note that expected RSTD and expected RSTD uncertainty are already accounted for in the calculation of . |
| vivo | To Qualcomm, would you please clarify how it is accounted in the calculation of ?  NW may not always ensure that the search window defined by *nr-DL-PRS-ExpectedRSTD* and *nr-DL-PRS-ExpectedRSTD-Uncertainty* together can be covered by MGL, i.e., at least partially overlapping with MGL. If it happens, UE behaviour should be specified.  One option is as option 1 that UE performs measurement through the entire MGL. The other option would be UE is not required to perform measurement. We prefer option 1. |
| Huawei | Option 2.  On option 1, we think it is defining new UE behavior. Ue is only supposed to search over the window given by expected RSTD and expected RSTD uncertainty. If this window is outside MG, UE is not required to measure this resource. |
| Nokia | We agree with QC. *nr-DL-PRS-ExpectedRSTD* and *nr-DL-PRS-ExpectedRSTD-Uncertainty* is counted by 3Tc unit from a reference cell timing. If a PRS is transmitted in a slot, a UE can search around PRS occasion boundary using time offset with *nr-DL-PRS-ExpectedRSTD* and *nr-DL-PRS-ExpectedRSTD-Uncertainty.* As long as PRS is overlapped with MGL, the search window is covered by MGL, can be counted. |

#### Issue 2-2-3: Requirements applicability for PRS resource not overlapping with MG

* Proposals
  + Option 1a (OPPO)
    - The measurement delay and accuracy requirements do not apply for a PRS resource not overlapped with MG.
    - For the calculation of CSSF, a PFL should be excluded if none of PRS resources in this PFL are overlapped with MG.
  + Option 1b (QC)
    - Measurement requirements apply only for PRS resources that are “fully covered by the MG”
* Recommended WF
  + It is noted that that the following statement has been added in 9.9.1 of 38.133

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| * UE is only required to measure PRS resources that are fully or partially overlapped with measurement gaps, and the requirements in clause 9.9.2, 9.9.3 and 9.9.4 are applicable to PRS resources that are fully or partially overlapped with measurement gaps. |

* + Based on moderator’s understanding, this should have already covered option 1b.
  + Further discuss if clarifications as proposed in option 1a are needed or not.

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| **Company** | **Comments** |
| CATT | We think option 1a and 1b are aligned and have been included in the existing spec, no further clarification is needed. |
| Qualcomm | Option 1b with “fully covered by MG” defined as in option 2 in issue 2-2-1. RAN4 may want to use the term “fully covered within MG” since that has been used in previous agreements and it is not defined currently. If not, we suggest amending the previous agreements to say “overlapped with MG.” |
| vivo | We also think no further clarification is needed as it is covered by existing requirements. |
| Ericsson | Current wording in section 9.9.1 of 38.133 is fine. No further clarification is needed. |
| Huawei | No further clarification is needed |
| OPPO | We are fine to not introduce clarification if the definition of overlapping in issue 2-2-1 is clear. |
| Nokia | With 9.9.1 of 38.133, no further clarification is needed. |

### Sub-topic 2-3 Other

#### Issue 2-3-1: Whether to support of per-FR gap for PRS measurement in Rel-16

* Proposals
  + Option 1 (QC)
    - Clarify in TS 38.133 that Rel-16 PRS-based measurements are supported with per-UE measurement gaps only.
      * Tables 9.1.2-2 and 9.1.2-3 would be modified to exclude the applicability of per-FR measurement gaps for positioning measurements.
      * Applicability conditions for positioning measurements in sec 9.9.1 would explicitly mention per-UE measurement gaps.
* Recommended WF
  + Further discuss

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| **Company** | **Comments** |
| CATT | We don’t see the necessity on this limitation. Need further clarification why the support of per-FR gap for PRS is different from the support of per-FR gap for RRM. In our understanding, per-FR means UE can receive and process in FR1 and FR2 independently and it is not related to what type of measurement UE performed in the gap. |
| Qualcomm | Option 1. The existing UE per-FR capability was introduced for RRM measurements and extending it to PRS measurements is problematic because of different processing demands of positioning and RRM. Please see our paper for more details. We’d be happy to discuss if there are questions.  As companies in RAN4 are well aware, there have been many issues with trying to tack on more functionality to the per-FR capability. Ideally, a new capability should have been introduced in Rel-16 for PRS but it’s too late now. Our proposal, although not ideal, is offered as a low-impact solution in Rel-16. A new capability or signaling to indicate per-FR support for PRS would be introduced in Rel-17. |
| vivo | We are open to have further discussion. We understand the impact to UE implementation of per-FR gap being used for PRS measurement. We also see the benefit of supporting per-FR gap for PRS measurement that there is no interruption to service if PRS measurement in different frequency range are performed with per-FR gap or no gap at all. |
| Intel | we are fine for Option 1.  In practical , we don’t see the necessity to config per-FR gap for PRS measurements since the measurement on the different FRs may introduce some extra error due to the different SCS/BW. So |
| Ericsson | We are fine with Option 1. |
| Huawei | We do not see the need of option 1.  We agree that there could be some differences between PRS measurement and RRM measurement, and it is challenging for UE to perform both measurements simultaneously even UE supports per FR gap. However, this issue was already addressed with the following statement in clause 9.1.5.2.2.   |  | | --- | | For UEs which support and are configured with per FR gaps, the CSSF requirements do not apply when NR PRS measurement in one FR gap collides with SSB/CSI-RS/PRS measurements in the other FR gap in time domain. |   We think it is sufficient except that the highlighted “gap” should be removed because SSB/CSI-RS measurement in the other FR could be performed without gap, and we do not see the need to limit the use of per-FR gap for PRS measurement. |

#### Issue 2-3-2: Clarification on the start of measurement period

* Proposals
  + Option 1 (QC)
    - The starting point for the PRS-RSTD measurement period should be as follows:
      * The time starts from the first MG instance aligned with a DL PRS resource(s) in the assistance data after both the *NR-TDOA-ProvideAssistanceData* message and *NR-TDOA-RequestLocationInformation* message are delivered from LMF to the physical layer of UE via LPP [34].”
    - The starting point for the PRS-RSRP measurement period should be as follows
      * When PRS-RSRP measurements are configured for DL-AoD, the time starts from the first MG instance aligned with DL PRS resources in the assistance data after both the *NR-DL-AoD-RequestLocationInformation* message and *NR-DL-AoD-ProvideAssistanceData* message from LMF via LPP [34] are delivered to the physical layer of UE.”
    - The starting point for the UE Rx-Tx measurement period should be as follows:
      * The time starts from the first MG instance aligned with DL PRS resources in the assistance data after both the *NR-Multi-RTT-RequestLocationInformation message* and *NR-Multi-RTT-ProvideAssistanceData message from LMF* via LPP [34] are delivered to the physical layer of UE.”
* Recommended WF
  + Further discuss

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| **Company** | **Comments** |
| CATT | Since we have no per positioning frequency layer requirement, we are fine to clarify the starting point of rather than the starting point of . |
| Qualcomm | Option 1 |
| vivo | Since the time of assistance data are delivered to the physical layer of UE is not visible outside, it is not testable. We think current spec is already addressed the starting point. For example, the RSTD requirements are specified as blow.  When physical layer receives last of *NR-TDOA-ProvideAssistanceData* message and *NR-TDOA-RequestLocationInformation* message from LMF via LPP [34]*,* ]*,* the UE shall be able to measure and report multiple (up to the UE capability specified in Clause 9.9.2.3) DL RSTD measurements, defined in TS 38.215 [4], during the measurement period defined as:  The starting point doesn’t have to be the first MG instance. So, no further clarification is needed. |
| Ericsson | We do not see any need to define starting point as the first MG after receiving both messages. The first MG may not even contain PRS e.g. if PRS resource period > MGRP.  In LTE for RSTD inter-frequency measurement the starting point is when receiving both messages are received by UE physical layer. |
| Huawei | Option 1 is fine. |
| Nokia | Need further check between QC and Ericsson observation.  Referring to LTE, TS37.571-1 is User Equipment (UE) conformance specification for UE positioning, it states that the beginning of measurement period is aligned with the first PRS subframe. We assume this is the first sumbframe after receiving the measurement request.    One question ; regarding the second bullet, why do you refer to PRS-RSRP configured for “DL-AoD” ? *ECID-ProvideLocationInformation* can trigger PRS-RSRP measurement request. |

## Companies views’ collection for 1st round

### Open issues

### CRs/TPs comments collection

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| **CR/TP number** | **Comments collection** |
| R4-2111987 (CATT) | Moderator: this CR is not for open issues listed in section 2.2, so please provide your comments to the CR directly here, if any. |
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| R4-2112569 (vivo) | Qualcomm2: Pending issue 2-1-1 |
| R4-2114066 (Nokia) | Qualcomm2: Pending issue 2-1-1 |
| R4-2114279 (HW) | Qualcomm2: Pending issues 2-1-1 and 2-1-2 |
| R4-2114205 (QC) | Ericsson: OK. |
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## Summary for 1st round

### Open issues

#### Sub-topic 2-1 CSSF

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| Issue 2-1-1: Selection of one PFL in CSSF calculation *Tentative agreements:*  *Candidate options:*   * + Option 1 (vivo)     - When multiple PFLs are configured, the PFL under measurement for positioning is assumed for CCSF calculation for an RRM frequency layer.     - CCSF calculation for an RRM frequency layer is the same as Rel-15 by assuming the PFL under measurement as the candidate positioning frequency layer.   + Option 2 (OPPO, HW, QC)     - For defining CSSF for an RRM frequency layer,       * N intermediate CSSF values would be calculated, where N is the number of PFLs and each intermediate CSSF value accounts for only one of the PFLs.       * The CSSF value for the RRM frequency layer is the highest one among the N intermediate CSSF values.   *Recommendations for 2nd round:*  Further discuss the options. |
| Issue 2-1-2: Requirement applicability for long periodicity measurement *Tentative agreements:*  *Candidate options:*   * + Option 1 (CATT, Intel, OPPO, Nokia, QC, HW)     - Measurement requirements do not apply if some of the PRS resources in the PFL can be measured with periodicity shorter than or equal to 160 ms. i.e. none of the PRS resources in the PFL would be measured.   + Option 2 (vivo, Ericsson)     - Long periodicity measurement requirements apply even if some of the PRS resources in the PFL can be measured with periodicity shorter or equal to 160ms   *Recommendations for 2nd round:*  Further discuss the options. |

#### Sub-topic 2-2 PRS resource being overlapped with MG

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| Issue 2-2-1: Definition *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:*  As the issue has been discussed for many meetings and all 3 proposed options are technically aligned with just wording difference, moderator suggests companies to check if there is any concern with the current wording in 9.9.1.  In this meeting, there is one CR from HW with changes to 9.9.1, so if you have any suggestions on the wording, please provide your updates to the CR R4-2114279 directly. |
| Issue 2-2-2: Consideration of RSTD search window *Tentative agreements:*  *Candidate options:*   * + Option 1 (vivo, CATT)     - If the search window defined by *nr-DL-PRS-ExpectedRSTD* and *nr-DL-PRS-ExpectedRSTD-Uncertainty* together is not covered by MGL, the UE is supposed to do PRS measurement within the entire MGL.   + Option 2 (HW, QC, Nokia)     - Take into account expected RSTD and expected RSTD uncertainty in defining overlap between PRS resource and MG.   *Recommendations for 2nd round:*  Further discuss the options. |
| Issue 2-2-3: PRS resource being overlapped with (or fully covered by) MG *Tentative agreements:*  Current wording in section 9.9.1 of 38.133 is fine, no further clarification is needed.  *Candidate options:*  *Recommendations for 2nd round:*  None |

#### Sub-topic 2-2 Other

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| Issue 2-3-1: Whether to support of per-FR gap for PRS measurement in Rel-16 *Tentative agreements:*  *Candidate options:*   * + Option 1 (QC, Intel, Ericsson)     - Clarify in TS 38.133 that Rel-16 PRS-based measurements are supported with per-UE measurement gaps only.       * Tables 9.1.2-2 and 9.1.2-3 would be modified to exclude the applicability of per-FR measurement gaps for positioning measurements.       * Applicability conditions for positioning measurements in sec 9.9.1 would explicitly mention per-UE measurement gaps.   + Option 2 (CATT, HW)     - No change is needed, PRS measurement can be performed with per-FR gap.   *Recommendations for 2nd round:*  Further discuss the options. |
| Issue 2-3-2: Clarification on the start of measurement period *Tentative agreements:*  *Candidate options:*   * + Option 1 (QC)     - The starting point for the PRS-RSTD measurement period should be as follows:       * The time starts from the first MG instance aligned with a DL PRS resource(s) in the assistance data after both the *NR-TDOA-ProvideAssistanceData* message and *NR-TDOA-RequestLocationInformation* message are delivered from LMF to the physical layer of UE via LPP [34].”     - The starting point for the PRS-RSRP measurement period should be as follows       * When PRS-RSRP measurements are configured for DL-AoD, the time starts from the first MG instance aligned with DL PRS resources in the assistance data after both the *NR-DL-AoD-RequestLocationInformation* message and *NR-DL-AoD-ProvideAssistanceData* message from LMF via LPP [34] are delivered to the physical layer of UE.”     - The starting point for the UE Rx-Tx measurement period should be as follows:       * The time starts from the first MG instance aligned with DL PRS resources in the assistance data after both the *NR-Multi-RTT-RequestLocationInformation message* and *NR-Multi-RTT-ProvideAssistanceData message from LMF* via LPP [34] are delivered to the physical layer of UE.”   + Option 2 (vivo, Ericsson)     - The starting point should not be the first MG instance.   *Recommendations for 2nd round:*  Further discuss the options.  It is noted that in the current requirements, the start point is already defined based on first MG instance aligned with DL PRS resources, and the proposal in option 1 is to clarify that instead of , it is that starts from the first MG instance aligned with DL PRS resources. |

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

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

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

# Topic #3: PRS-RSRP measurement period

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc** | **Company** | **Proposals / Observations** |
| [**R4-2112541**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112541.zip) | vivo | **Proposal 1: When PRS-RSRP is configured for DL-TDOA, no application rule of measurement requirements is needed as existing requirements in clause 9.9.2 already specified/clarified measurement requirements for PRS-RSRP.**  **Proposal 2: When PRS-RSRP is configured for multi-RTT, no application rule of measurement requirements is needed as existing requirements in clause 9.9.4 already specified/clarified measurement requirements for PRS-RSRP.** |
| [**R4-2112565**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112565.zip) | vivo | CR |
| [**R4-2114234**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114234.zip) | Nokia, Nokia Shanghai Bell | 1. RSRP values are basic and easy-to-use to set up positioning measurements such as beam correspondence and to evaluate measurement reliability. 2. RAN1/2 define separate UE capability on PRS-RSRP measurement combined for other positioning methods.   **Proposal 1 : When PRS-RSRP measurement is required when configured for DL-TDOA or multi-RTT, the measurement period is supposed to be same as DL-TDOA or multi-RTT measurement period respectively. Accordingly, the DL-TDOA or multi-RTT measurement period requirements respectively are applied to PRS-RSRP in this case. ( option-1 )** |
| [**R4-2114272**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114272.zip) | Huawei, HiSilicon | **Proposal 1: Remove requirements related to PRS-RSRP for DL-TDOA or multi-RTT in clause 9.9.3.** |
| [**R4-2114273**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114273.zip) | Huawei, HiSilicon | CR |
| [**R4-2114452**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114452.zip) | Ericsson | * **Observation 1**: The following was agreed: When PRS-RSRP is configured for DL-TDOA, RSTD and RSRP are performed over the same measurement period. * **Observation 2**: PRS-RSRP and RSTD are technically different measurements even if performed over the same measurement period and performed by using the same assistance data. * **Proposal 1**: When PRS-RSRP is configured for DL-TDOA then PRS-RSRP meets requirements defined for PRS-RSRP in clause 9.9.3, TS 38.133. |
| [**R4-2114453**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114453.zip) | Ericsson | CR |

## Open issues summary

### Sub-topic 3-1 Applicable rrequirements for PRS-RSRP configured for DL-TDOA (multi-RTT)

#### Issue 3-1-1: Applicable requirements for PRS-RSRP configured for DL-TDOA (multi-RTT)

* Proposals
  + Option 1 (vivo, Nokia, HW)
    - Requirements specified for RSTD (UE Rx-Tx) in clause 9.9.2 (9.9.4) apply
  + Option 2 (Ericsson)
    - Requirements specified for PRS-RSRP in clause 9.9.3 apply
* Recommended WF
  + Further discuss

|  |  |
| --- | --- |
| **Company** | **Comments** |
| CATT | Prefer option 1. And from the current measurement requirements, we think the option 1 and option 2 are generally the same. |
| Qualcomm | Option 1. |
| vivo | Option 1. |
| Intel | Option 1 |
| Ericsson | The measurement period is the same in both cases. But it is bit confusing to state the PRS-RSRP meets requirements over RSTD measurement period. |
| Huawei | Option 1 |
| OPPO | Option 1. |
| Ericsson2 | We are fine to compromise on option 1 |
| Nokia | Option-1 |

## Companies views’ collection for 1st round

### Open issues

### CRs/TPs comments collection

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2112565 (vivo) |  |
| Qualcomm2: OK |
|  |
| R4-2114273 (HW) | Qualcomm2: Comments uploaded. |
|  |
|  |
| R4-2114453 (Ericsson) | Qualcomm2: Pending issue 3-1-1. |
|  |
|  |

## Summary for 1st round

### Open issues

#### Sub-topic 3-1 Applicable requirements for PRS-RSRP configured for DL-TDOA (multi-RTT)

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| Issue 3-1-1: Applicable requirements for PRS-RSRP configured for DL-TDOA (multi-RTT) *Tentative agreements:*  Requirements specified for RSTD (UE Rx-Tx) in clause 9.9.2 (9.9.4) apply  *Candidate options:*  *Recommendations for 2nd round:*  None |

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

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

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

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc** | **Company** | **Proposals / Observations** |
| [**R4-2111984**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2111984.zip) | CATT | **Proposal 1: It is preferred that 160ms is used for the value of X in PRS/SRS proximity condition.**  **Proposal 2: If the PRS/SRS proximity condition is not met, UE can still measure and report the UE Rx-Tx time difference within the measurement period, but the accuracy requirements is not applied due to lack of SRS resources.**  **Proposal 3: UE shall continue UE Rx-Tx time difference measurement and the measurement requirements are still applicable when TA changes due to TA command.**  **Proposal 4: For the case of NTA\_offset change, UE can still perform measurement and the measurement requirements are not impacted.**  **Proposal 5: When cell change impacting SRS occurs during the measurement period, UE shall restart the UE Rx-Tx time difference measurement after the SRS reconfiguration on the target cell is complete.**  **Proposal 6: For the case of cell change not impacting SRS, no clarification is needed in core requirements in the specification.** |
| [**R4-2112542**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112542.zip) | vivo | **Proposal 1:****Value of X in PRS/SRS proximity condition is 160ms.**  **Proposal 2: UE still measures and reports UE Rx-Tx measurement if PRS/SRS proximity condition is not met.**  **Proposal 3: A note may be needed that positioning accuracy may be degraded when PRS/SRS proximity condition is not met.**  **Proposal 4: The UE shall discard the ongoing UE Rx-Tx time difference measurement and starts a new measurement if the uplink transmission timing due to network-configured TA changes during the UE Rx-Tx measurement period.**  **Proposal 5:****UE Rx-Tx time difference measurement requirements are not applicable if TA command is received during the measurement period.**  **Proposal 6: The UE shall discard the UE Rx-Tx time difference measurement and starts a new measurement if NTA-offset changes during the UE Rx-Tx measurement period.**  **Proposal 7:****UE Rx-Tx time difference measurement requirements are not applicable if NTA-offset changes during the measurement period.**  **Proposal 8: For the cell change impacting SRS configuration, UE shall continue the on-going UE Rx-Tx time difference measurement, and the current measurement period and accuracy apply.**  **Proposal 9: For the cell change NOT impacting SRS configuration, the UE shall continue the on-going UE Rx-Tx time difference measurement and the current measurement period and accuracy apply.**  **Proposal 10: For TA change due to cell change, the UE behavior should follow the conclusion of impact due to TA change.** |
| [**R4-2112567**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112567.zip) | vivo |  |
| [**R4-2113260**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2113260.zip) | OPPO | **Proposal 1: Support X=160ms for PRS/SRS proximity.**  **Proposal 2: UE is still expected to measure and report UE Rx-Tx measurement if PRS/SRS proximity condition is not met.**  **Proposal 3: UE Rx-Tx time difference accuracy do not apply if PRS/SRS proximity condition is not met.**  **Proposal 4: In case of cell change impacting SRS configuration, support option 1 that the UE shall restart the UE Rx-Tx time difference measurement after the SRS reconfiguration on the target cell is complete**  **Proposal 5: In case of cell change not impacting SRS configuration, support option 1b that the UE shall continue the on-going UE Rx-Tx time difference measurement, and longer measurement period is expected.**  **Proposal 6: In case of TA change due to TA command, UE shall discard the UE Rx-Tx time difference measurement, and the UE Rx-Tx time difference measurement requirements are not applicable.**  **Proposal 7: If NTA\_offset changes during the measurement period, UE should discard the UE Rx-Tx time different measurement and the requirements are not applicable.** |
| [**R4-2113261**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2113261.zip) | OPPO |  |
| [**R4-2114194**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114194.zip) | Qualcomm Incorporated | **Proposal 1: Value of X in the PRS/SRS proximity condition: X=80 ms.**  **Proposal 2: When the PRS/SRS proximity condition is not met, UE Rx-Tx time difference measurement requirements do not apply and UE behavior is left to implementation.**  **Proposal 3: UE Rx-Tx time difference measurement requirements are not applicable if TA command is received during the measurement period. UE behavior is left up to implementation.**  **Proposal 4: UE Rx-Tx measurement requirements are not applicable if the NTA\_offset changes during the measurement period. UE behavior is left up to implementation.**  **Proposal 5: If a serving cell change impacting the configuration of SRS for positioning occurs during the UE Rx-Tx time difference measurement period, the measurement period is restarted after SRS reconfiguration on the target cell is complete.**  **Proposal 6: If a serving cell change that does not impact the configuration of SRS for positioning occurs during the UE Rx-Tx time difference measurement period, the UE Rx-Tx shall continue the measurement and the measurement period can be longer.** |
| [**R4-2114235**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114235.zip) | Nokia, Nokia Shanghai Bell | **Observation 1 :** In certain UL transmission conditions, SRS-P scheduling and transmission may not meet the proximity condition, since SRS-P transmission has the lowest transmission priority in Rel-16.  **Observation 2 :** As one concern, a UE may not complete a measurement report, if SRS-P scheduling transmission may not meet the proximity condition.   1. Regarding PRS/SRS proximity, we support X=160ms (option-2). 2. Regarding UE behavior out of the proximity, UE RX-TX time measurement and report should work within the required measurement period. (option-1) 3. Regarding requirements out of the proximity, we can agree that the current accuracy requirement may not applied (Option-1a) 4. Regarding TA change due to TA command or autonomous timing adjustment, we support option 1. A UE shall continue UE Rx-Tx time difference measurement and meet accuracy requirements. 5. Regarding TA change due to NTA\_offset change, we support option 2 in requirement, that is measurement requirements are not applicable if the NTA\_offset changes during the measurement period. |
| [**R4-2114275**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114275.zip) | Huawei, HiSilicon | **Proposal 1: Adopt X=160ms for the SRS/PRS proximity condition.**  **Proposal 2: UE should still meet the measurement period requirements if PRS/SRS proximity condition is not met, but the measurement accuracy requirements do not apply.**  **Proposal 3: Measurement requirements for UE Rx-Tx do not apply if there is TA change during the measurement period.**  **Proposal 4: Measurement requirements for UE Rx-Tx do not apply if there is NTA\_offset change during the measurement period.**  **Proposal 4: If any of the the serving cell (PCell, PSCell, or SCell) configured with the SRS for positioning changes during the measurement period, UE restarts the Rx-Tx measurement.**  **Proposal 5: If any of the the serving cell (PCell, PSCell, or SCell) NOT configured with the SRS for positioning changes during the measurement period, UE continues the Rx-Tx measurement** **and the current measurement period and accuracy requirements should apply.** |
| [**R4-2114276**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114276.zip) | Huawei, HiSilicon |  |
| [**R4-2114455**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114455.zip) | Ericsson | **PRS/SRS proximity condition:**   * **Observation 1**: SRS may also be used for other purposes and in some scenarios SRS overheads may have to kept low. Shorter value of in PRS/SRS proximity condition will put more restriction on network. * **Observation 2**: When PRS/SRS proximity condition is not met then UE not meeting measurement requirement may lead to worse positioning accuracy. * **Proposal 1**: The Value of X in PRS/SRS proximity condition is 160 ms. * **Proposal 2**: If SRS and PRS proximity condition in proposal 1 is not met then it is up to the UE whether to transmit the UE Rx-Tx measurement results. * **Proposal 3**: If the SRS and PRS proximity condition in proposal 1 is not met then the UE is not expected to meet the UE Rx-Tx time difference measurement requirements.   **UE Rx-Tx measurement procedure under cell TA command change:**   * **Observation 3** The network configured TA command may require the UE to adjust its uplink timing in very larger adjustment step. * **Observation 4** The network configured TA command may require the UE to adjust its uplink timing in any direction wrt the DL timing. * **Observation 5** The UE takes multiple samples for the UE Rx-Tx time difference measurement and some may be taken before while others after the TA change inducing large positioning error if used for positioning. * **Observation 6** Rx-Tx time difference measurement accuracy in clause 10.1.25.2, TS 38.133 does not apply under network-controlled TA change. Therefore, the UE should discard the Rx-Tx time difference measurement to prevent reporting of inaccurate measurement results. * **Proposal 4**: The UE shall discard the UE Rx-Tx time difference measurement if the uplink transmission timing changes due to network-configured TA during the UE Rx-Tx measurement period. * **Proposal 5**: The UE Rx-Tx time difference measurement requirements are not applicable if the uplink transmission timing changes due to network-configured TA during the UE Rx-Tx measurement period.   **UE Rx-Tx measurement procedure under NTA\_offset change**   * **Observation 6**: The change in the NTA\_offset can cause very large change in the uplink transmission timing of the UE resulting in highly inaccurate measurement result. * **Observation 7:** The UE takes multiple samples for the UE Rx-Tx time difference measurement and some may be taken before while others after the NTA\_offset change inducing large positioning error if used for positioning. * **Proposal 6**: The UE shall discard the UE Rx-Tx measurement if the NTA\_offset changes during the UE Rx-Tx measurement period. * **Proposal 7**: UE Rx-Tx measurement requirements (section 9.9.4 in TS 38.133) are not applicable if the NTA\_offset changes during the UE Rx-Tx measurement period.   **UE Rx-Tx measurement procedure under cell change:**   * **Observation 8:** The SRS used for the UE Rx-Tx time difference measurement may not always be configured on the serving cell which is changed. * **Observation 9:** Even when the cell change does not impact SRS configuration and the UE continues the ongoing UE Rx-Tx time difference measurement, the cell change may introduce additional delay in the UE Rx-Tx time difference measurement period. * **Proposal 8**: When the cell change impacts the SRS, then the UE shall restart the UE Rx-Tx time difference measurement after the SRS reconfiguration on the target cell is complete. * **Proposal 9**: When the cell change does not impact the SRS, then UE shall continue the on-going UE Rx-Tx time difference measurement and the current measurement period and accuracy apply. * **Proposal 10**: In scenario in proposal 9, longer UE Rx-Tx time difference measurement period is expected. In this case UE Rx-Tx time difference measurement period (TUERxTx,total,HO) shall be as follows:   TUERxTx,total,HO = TUERxTx,HO + K\*Teffect + THO  Where:  - K is the number of times the handover occurs during TUERxTx,total,HO;  - Teffect is the largest Teffect,i among all the positioning frequency layers;  - THO is the time during which the UE Rx-Tx time difference measurement may not be possible due to handover; it can be up to Tinterrupt as defined in clause 6.1 of TS 38.133. |
| [**R4-2114456**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114456.zip) | Ericsson |  |

## Open issues summary

*It is noted that Proposal 4 from Nokia R4-2114235 mentions accuracy requirements, but it has been agreed in R4-2008664 that accuracy requirements do not apply in case of TA change.*

### Sub-topic 4-1 SRS/PRS proximity

#### Issue 4-1-1: Value for X

* Proposals
  + Option 1 (QC)
    - 80ms
  + Option 2 (CATT, Nokia, OPPO, vivo, Ericsson, HW)
    - 160ms
* Recommended WF
  + Further discuss

|  |  |
| --- | --- |
| **Company** | **Comments** |
| CATT | Prefer option 2. |
| vivo | Option 2 |
| Ericsson | Option 2 |
| Huawei | Option 2 |
| Qualcomm2 | We can compromise to option 2. |
| OPPO | Option 2. |
| Nokia | Option 1 |

#### Issue 4-1-2: UE behaviour and requirements when proximity condition is not met

* Proposals for UE behaviour
  + Option 1 (CATT, OPPO, vivo, Nokia, HW)
    - The UE should still measure and report UE Rx-Tx measurement even if PRS/SRS proximity condition is not met
  + Option 2 (QC, Ericsson)
    - Up to UE implementation
* Proposals for requirements
  + Option 1 (CATT, OPPO, Nokia, HW)
    - UE Rx-Tx measurement period requirements apply, but the UE Rx-Tx accuracy requirements may not apply
  + Option 2 (vivo)
    - Both UE Rx-Tx measurement period and measurement accuracy requirements apply
    - A note may be needed that positioning accuracy may be degraded when PRS/SRS proximity condition is not met.
  + Option 3 (QC, Ericsson)
    - UE Rx-Tx time difference measurement requirements do not apply.
* Recommended WF
  + Further discuss

|  |  |
| --- | --- |
| **Company** | **Comments** |
| CATT | Option 1 for UE behavior and Option 1 for requirements. Even if the PRS/SRS proximity condition is not met, the measurements are not impacted. The measurement requirements can still apply based on the configured resource periodicity. But the accuracy requirements cannot be applied due to the long internal between PRS and SRS. |
| Qualcomm | UE behavior: Option 2  Requirements: Option 3 |
| vivo | UE behavior: Option 1  Requirements: Option 2 |
| Intel | UE behavior: Option 2  Requirements: Option 3 |
| Ericsson | UE behavior: Option 2  Requirements: Option 3 |
| Huawei | UE behavior: Option 1  Requirements: Option 3 or option 2 |
| OPPO | UE behavior: option 1  Requirements: option 1 |
| Nokia | UE behavior: option 1  Requirements: option 1 |

### Sub-topic 4-2 Measurement period requirements with UL timing change

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

* Proposals for UE behaviour
  + Option 1 (CATT, Nokia)
    - UE shall continue UE Rx-Tx time difference measurement
  + Option 2 (OPPO, vivo, Ericsson)
    - UE shall discard the UE Rx-Tx time difference measurement
  + Option 3 (QC, HW)
    - Up to UE implementation
* Proposals for requirements
  + Option 1 (CATT, Nokia)
    - UE Rx-Tx measurement period requirements are not impacted
  + Option 2 (OPPO, QC, vivo, HW, Ericsson)
    - UE Rx-Tx measurement period requirements are not applicable
* Recommended WF
  + Further discuss

|  |  |
| --- | --- |
| **Company** | **Comments** |
| CATT | Option 1 for UE behavior and Option 1 for requirements. The measurement requirements are only depending on the PRS resource configuration and not impacted by the TA change. |
| Qualcomm | UE behavior: Option 3  Requirements: Option 2 |
| vivo | UE behavior: Option 2  Requirements: Option 2 |
| Intel | UE behavior: Option 2  Requirements: Option 3 |
| Ericsson | UE behavior: Option 2  Requirements: Option 2  **To CATT**: UE Rx-Tx time difference measurement requirements apply only when both PRS and SRS are configured, and not just PRS. Please see below from 38.133. TA change means SRS transmit timing will change and will induce error in UE Rx-Tx time difference measurement.  9.9.4.2 Requirements Applicability  The requirements in clause 9.9.4 apply for periodic and triggered UE Rx-Tx time difference measurements, provided:  - UE Rx-Tx time difference measurement related side conditions given in clause 10.1.25 are met for a corresponding band.  - SRS is configured on at least one of the PCell, PSCell and Scell. |
| Huawei | UE behavior: Option 3  Requirements: Option 2 |
| OPPO | UE behavior: option 2  Requirements: option 2 |
| Nokia | UE behavior: option 1  Requirements: option 1  We wonder how come UE Rx-Tx measurement period requirements are impacted? The TA change will be negligible comparing to the total measurement period. |

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

* Proposals for UE behaviour
  + Option 1 (CATT)
    - UE shall continue UE Rx-Tx time difference measurement
  + Option 2 (OPPO, vivo, Ericsson)
    - UE shall discard the UE Rx-Tx time difference measurement
  + Option 3 (QC, HW)
    - Up to UE implementation
* Proposals for requirements
  + Option 1 (CATT)
    - UE Rx-Tx measurement period requirements are not impacted
  + Option 2 (OPPO, QC, vivo, Nokia, HW, Ericsson)
    - UE Rx-Tx measurement period requirements are not applicable
* Recommended WF
  + Further discuss

|  |  |
| --- | --- |
| **Company** | **Comments** |
| CATT | Option 1 for UE behavior and Option 1 for requirements. Same as the case of the TA change due to TA command. |
| Qualcomm | UE behavior: Option 3  Requirements: Option 2 |
| vivo | UE behavior: Option 2  Requirements: Option 2 |
| Intel | UE behavior: Option 2  Requirements: Option 3 |
| Ericsson | UE behavior: Option 2  Requirements: Option 2 |
| Huawei | UE behavior: Option 3  Requirements: Option 2 |
| OPPO | UE behavior: option 2  Requirements: option 2 |
| Nokia | UE behavior: option 1  Requirements: option 2 |

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

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

* Proposals
  + Option 1 (CATT, OPPO, QC, HW, Ericsson)
    - UE shall restart the UE Rx-Tx time difference measurement after the SRS reconfiguration on the target cell is complete.
  + Option 2 (vivo)
    - UE shall continue the on-going UE Rx-Tx time difference measurement, and the current measurement period and accuracy apply.
* Recommended WF
  + Further discuss

|  |  |
| --- | --- |
| **Company** | **Comments** |
| CATT | Support option 1. |
| Qualcomm | Option 1. |
| vivo | Option 2.  Since SRS is irrelevant of UE Rx-Tx time difference measurement which is based on PRS, UE should continue ongoing measurements. |
| Intel | Option 1 |
| Ericsson | Option 1.  **To Vivo**: SRS is not irrelevant for UE Rx-Tx time difference. On the contrary UE Rx-Tx time difference measurement requirements become irrelevant if SRS is not configured. Please see below from 38.133:  9.9.4.2 Requirements Applicability  The requirements in clause 9.9.4 apply for periodic and triggered UE Rx-Tx time difference measurements, provided:  - UE Rx-Tx time difference measurement related side conditions given in clause 10.1.25 are met for a corresponding band.  - SRS is configured on at least one of the PCell, PSCell and SCell. |
| Huawei | Option 1.  We can understand the point mentioned by vivo, but we also agree with Ericsson that it may not be meaningful to require UE to continue Rx-Tx measurement if there is no valid SRS configuration. |
| OPPO | Option 1 |
| Nokia | Option-1 |

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

* Proposals
  + Option 1a (CATT)
    - No clarification is needed in core requirements in the specification
  + Option 1b (vivo, HW)
    - UE shall continue the on-going UE Rx-Tx time difference measurement and the current measurement period and accuracy apply.
  + Option 2a (OPPO, QC)
    - UE shall continue the on-going UE Rx-Tx time difference measurement, and longer measurement period is expected.
  + Option 2b (Ericsson)
    - UE shall continue the on-going UE Rx-Tx time difference measurement, and longer measurement period is expected.
    - In this case UE Rx-Tx time difference measurement period (TUERxTx,total,HO) shall be as follows:

TUERxTx,total,HO = TUERxTx,HO + K\*Teffect + THO

K is the number of times the handover occurs during TUERxTx,total,HO;

Teffect is the largest Teffect,i among all the positioning frequency layers;

THO is the time during which the UE Rx-Tx time difference measurement may not be possible due to handover; it can be up to Tinterrupt as defined in clause 6.1 of TS 38.133.

* Recommended WF
  + Further discuss

|  |  |
| --- | --- |
| **Company** | **Comments** |
| CATT | Support option 1a and option 1b. In this case, PRS and SRS are both not impacted, and the current requirements should still apply. |
| Qualcomm | Option 2a. Regarding option 2b, is the proposal to reuse the same structure but modify it with different parameters? |
| Vivo | Option 1b. For option 2a/2b, the question would be how SRS configuration can actually impact UE Rx-Tx time difference measurement based on DL PRS. |
| Intel | Option 2a is fine for us. |
| Ericsson | We are fine with either option 2a or 2b. In the last meeting companies ask about extra delay due to cell change. In our view the extra delay is the same as for RSTD or PRS-RSRP due to HO.  There is small typo in subscript. The correct eq.is:  TUERxTx,total,HO = TUERxTx,Total + K\*Teffect + THO  is defined in section 9.9.4.5.  **To CATT:** The PRS can be impacted due to HO e.g. it can be interrupted due to HO interruption. In this case the UE cannot measure on that PRS and need another PRS occasion. So extension is needed. This is the same situation as in case of PRS-RSRP and RSTD under HO; their respective measurement periods (sections 9.9.2.5 (RSTD) and 9.9.3.5 (RSRP)) are extended by .  **To QC**: Even parameters K, Teffect and THO are the same as in RSTD with HO, as below: |
| Huawei | Option 1b, and we are also fine with option 1a which has same effect as option 1b from requirement perspective.  On option 2a, we have same question as vivo, i.e. in which case such cell change would cause longer measurement period?  On option 2b, it has been already agreed that in case of HO the Rx-Tx measurement will be re-started, but this option is saying UE should continue the measurement with longer measurement period. |
| OPPO | Option 2a. Interruption may be needed to perform cell change. If the majority view is that the interruption can be ignored, then we can agree with option 1. |
| Ericsson2 | To Vivo/Huawei:  In this scenario there are two issues:   1. Cell change 2. Unchanged SRS configuration i.e. same SRS configuration before and after the cell change. This is typically a case when SRS is on serving cell which is NOT changed but another serving cell is changed.   The first issue (cell change) may cause interruption and may interrupt PRS. It may even interrupt SRS. That’s why the UE may have to extend its period.  The situation is the same as for RSTD / PRS-RSRP with cell change. |
| Nokia | Support option-1b, but can compromise to option-2a. |

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

* Proposals
  + Option 1 (vivo)
    - For TA change due to cell change, the UE behavior should follow the conclusion of impact due to TA change.
* Recommended WF
  + Further discuss

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| --- | --- |
| **Company** | **Comments** |
| CATT | In our understanding, this case is same as the cell change impacting SRS, thus should follow the conclusion of cell change. |
| Qualcomm | This should be covered by agreements under sub-topic 4-2. Does it need to be discussed separately? |
| vivo | In our understanding, UE Rx-Tx time difference measurement can be impacted by TA change due to cell change, rather than whether SRS is reconfigured or not. So, if there is TA change during cell change UE may need to restart the measurement. The UE behavior would be similar to TA change due to TA command. |
| Ericsson | Covered under sub-topic 4-2. |
| Huawei | We think more clarification is needed.  Could vivo help to clarify if the intention is to discuss “UL timing change due to cell change”? If so we understand it may not be covered by 4-2-1 (UL timing change due to TA command).  We also agree with CATT that this case is already included in 4-3-1 (cell change impacting SRS), so could vivo help to clarify if there is any difference? |
| Nokia | Covered under sub-topic 4-2. |

## Companies views’ collection for 1st round

### Open issues

### CRs/TPs comments collection

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

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2112567 (vivo) | Qualcomm2: Pending issues in sub-topic 4-3. |
|  |
|  |
| R4-2113261 (OPPO) | Qualcomm2: OK |
|  |
|  |
| R4-2114276 (HW) | Qualcomm2: Comments uploaded. |
|  |
|  |
| R4-2114456 (Ericsson) | Qualcomm2: Pending issues 4-2-1, 4-2-2, 4-3-1, 4-3-2. |
|  |
|  |

## Summary for 1st round

### Open issues

#### Sub-topic 4-1 SRS/PRS proximity

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| --- |
| Issue 4-1-1: Value for X *Tentative agreements:*  *Candidate options:*  In the SRS/PRS proximity condition, X=160ms.  *Recommendations for 2nd round:*  None |
| Issue 4-1-2: UE behaviour and requirements when proximity condition is not met *Tentative agreements:*  *Candidate options:*   * Proposals for UE behaviour   + Option 1 (CATT, OPPO, vivo, Nokia, HW)     - The UE should still measure and report UE Rx-Tx measurement even if PRS/SRS proximity condition is not met   + Option 2 (QC, Ericsson, Intel)     - Up to UE implementation * Proposals for requirements   + Option 1 (CATT, OPPO, Nokia, HW)     - UE Rx-Tx measurement period requirements apply, but the UE Rx-Tx accuracy requirements may not apply   + Option 2 (vivo, HW)     - Both UE Rx-Tx measurement period and measurement accuracy requirements apply     - A note may be needed that positioning accuracy may be degraded when PRS/SRS proximity condition is not met.   + Option 3 (QC, Ericsson, Intel)     - UE Rx-Tx time difference measurement requirements do not apply.   *Recommendations for 2nd round:*  Further discuss the options. |

#### Sub-topic 4-2 Measurement period requirements with UL timing change

|  |
| --- |
| Issue 4-2-1: TA change due to TA command *Tentative agreements:*  *Candidate options:*   * Proposals for UE behaviour   + Option 1 (CATT, Nokia)     - UE shall continue UE Rx-Tx time difference measurement   + Option 2 (OPPO, vivo, Ericsson, Intel)     - UE shall discard the UE Rx-Tx time difference measurement   + Option 3 (QC, HW, Intel)     - Up to UE implementation * Proposals for requirements   + Option 1 (CATT, Nokia)     - UE Rx-Tx measurement period requirements are not impacted   + Option 2 (OPPO, QC, vivo, HW, Ericsson, Intel)     - UE Rx-Tx measurement period requirements are not applicable   *Recommendations for 2nd round:*  Further discuss the options. |
| Issue 4-2-2: TA change due to NTA\_offset change *Tentative agreements:*  *Candidate options:*   * Proposals for UE behaviour   + Option 1 (CATT, Nokia)     - UE shall continue UE Rx-Tx time difference measurement   + Option 2 (OPPO, vivo, Ericsson, Intel)     - UE shall discard the UE Rx-Tx time difference measurement   + Option 3 (QC, HW, Intel)     - Up to UE implementation * Proposals for requirements   + Option 1 (CATT)     - UE Rx-Tx measurement period requirements are not impacted   + Option 2 (OPPO, QC, vivo, Nokia, HW, Ericsson, Intel)     - UE Rx-Tx measurement period requirements are not applicable   *Recommendations for 2nd round:*  Further discuss the options.  Most companies have same proposal for NTA\_offset change and TA change in issue 4-2-1. Can we agree that same UE behavior and requirements applicability are used for NTA\_offset change and TA change? If so we can close this issue and focus on issue 4-2-1. |

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

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| --- |
| Issue 4-3-1: Measurement period requirements with cell change impacting SRS *Tentative agreements:*  *Candidate options:*   * + Option 1 (CATT, OPPO, QC, HW, Ericsson, Nokia)     - UE shall restart the UE Rx-Tx time difference measurement after the SRS reconfiguration on the target cell is complete.   + Option 2 (vivo)     - UE shall continue the on-going UE Rx-Tx time difference measurement, and the current measurement period and accuracy apply.   *Recommendations for 2nd round:*  Further discuss the options. |
| Issue 4-3-2: Measurement period requirements with cell change not impacting SRS *Tentative agreements:*  *Candidate options:*   * + Option 1a (CATT, HW)     - No clarification is needed in core requirements in the specification   + Option 1b (vivo, HW, CATT, Nokia)     - UE shall continue the on-going UE Rx-Tx time difference measurement and the current measurement period and accuracy apply.   + Option 2a (OPPO, QC, Intel, Ericsson, Nokia)     - UE shall continue the on-going UE Rx-Tx time difference measurement, and longer measurement period is expected.   + Option 2b (Ericsson)     - UE shall continue the on-going UE Rx-Tx time difference measurement, and longer measurement period is expected.     - In this case UE Rx-Tx time difference measurement period (TUERxTx,total,HO) shall be as follows:   TUERxTx,total,HO = TUERxTx,HO + K\*Teffect + THO  K is the number of times the handover occurs during TUERxTx,total,HO;  Teffect is the largest Teffect,i among all the positioning frequency layers;  THO is the time during which the UE Rx-Tx time difference measurement may not be possible due to handover; it can be up to Tinterrupt as defined in clause 6.1 of TS 38.133.  *Recommendations for 2nd round:*  Further discuss the options. |
| Issue 4-3-3: Measurement period requirements with cell change impacting TA *Tentative agreements:*  *Candidate options:*   * + Option 1 (vivo)     - For TA change due to cell change, the UE behaviour should follow the conclusion of impact due to TA change.   + Option 2 (CATT, QC, Ericsson, HW, Nokia)     - This scenario is already covered by other issues (4-2-1 or 4-3-1), no need to have separate discussion or agreement   *Recommendations for 2nd round:*  Further discuss the options. |

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

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

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

# Recommendations for Tdocs

## 1st round

**New tdocs**

|  |  |  |
| --- | --- | --- |
| **Title** | **Source** | **Comments** |
| WF on UE PRS measurement requirements | Huawei, HiSilicon |  |

**Existing tdocs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Tdoc number** | **Title** | **Source** | **Recommendation** | **Comments** |
| [R4-2111985](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2111985.zip) | Draft CR on PRS RSTD measurement requirements | CATT | Merged |  |
| [R4-2112563](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112563.zip) | Draft CR to 38.133 correction to PRS RSTD measurement requirements | vivo | Revised | Capture all agreed changes to RSTD requirements |
| [R4-2113258](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2113258.zip) | R16 CR to TS 38.133 on RSTD measurements | OPPO | Merged |  |
| [R4-2114270](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114270.zip) | CR to update RSTD measurement requirements | Huawei, HiSilicon | Merged |  |
|  |  |  |  |  |
| [R4-2112565](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112565.zip) | Draft CR to 38.133 correction on PRS-RSRP measurement requirements | vivo | Merged |  |
| [R4-2114273](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114273.zip) | CR to update PRS-RSRP measurement requirements | Huawei, HiSilicon | Merged |  |
| [R4-2114453](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114453.zip) | PRS-RSRP measurement requirements | Ericsson | Revised | Capture all agreed changes to PRS-RSRP requirements |
|  |  |  |  |  |
| [R4-2112567](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112567.zip) | Draft CR to 38.133 correction on UE Rx-Tx timing difference measurement requirements | vivo | Merged |  |
| [R4-2113261](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2113261.zip) | R16 CR to TS 38.133 on UE Rx-Tx time difference measurements | OPPO | Revised | Capture all agreed changes to UE Rx-Tx requirements |
| [R4-2114276](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114276.zip) | CR to update UE Rx-Tx time difference measurement requirements | Huawei, HiSilicon | Merged |  |
| [R4-2114456](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114456.zip) | UE Rx-Tx measurement requirements | Ericsson | Merged |  |
|  |  |  |  |  |
| [R4-2111987](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2111987.zip) | Draft CR on ECID measurement requirements and AoA/ZoA report mapping | CATT | Agreeable | No comment received in the 1st round |
| [R4-2112569](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112569.zip) | Draft CR to 38.133 correction on CCSF for NR measurements for positioning | vivo | Merged |  |
| [R4-2114066](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114066.zip) | Selection of positioning frequency layer for MG occasion | Nokia, Nokia Shanghai Bell | Merged |  |
| [R4-2114279](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114279.zip) | CR on CSSF and requirement applicability for PRS measurement | Huawei, HiSilicon | Revised | Capture all agreed changes to CSSF and requirement applicability |
| [R4-2114205](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114205.zip) | Draft CR: Corrections to NR positioning measurement requirements | Qualcomm Incorporated | Revised | Capture all agreed changes to MG applicability |

Notes:

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

## 2nd round

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

Notes:

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

Annex

Contact information

|  |  |  |
| --- | --- | --- |
| **Company** | **Name** | **Email address** |
|  |  |  |

Note:

1. Please add your contact information in above table once you make comments on this email thread.
2. If multiple delegates from the same company make comments on single email thread, please add you name as suffix after company name when make comments i.e. Company A (XX, XX)