**3GPP TSG RAN WG4 Meeting #99-e R4-21xxxxx**

**Electronic Meeting, May 19-27, 2021**

**Agenda item:** 6.5.2.2

**Source:** Moderator (Intel Corporation)

**Title:** Email discussion summary for [98-bis-e][207] NR\_pos\_RRM\_Part\_2

**Document for:** Information

# Introduction

The scope of this email discussion is UE RRM requirements for NR positioning from the following agenda items:

* AI 6.5.2.2.1 RRM Perf requirements: General
* AI 6.5.2.2.2. Measurement accuracy requirements
* AI 6.5.2.2.3 Test cases

In providing comments, companies are encouraged to:

* Be concise
* Provide comments on all topics/sub-topics of interest
* Ensure that 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

# Topic #1: General performance requirements for NR Positioning (AI 6.5.2.1)

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2111330**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2111330.zip) Draft Big CR: Introduction of Rel-16 NR Positioning RRM performance requirements and test cases | Ericsson, Intel |  |
|  |  |  |

## Open issues summary and companies views’ collection for 1st round

*N.A.*

### Open issues

N.A.

### CRs/TPs comments collection

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
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## Summary for 1st round

### Open issues

### CRs/TPs

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| [**R4-211130**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C98e-b%5CDocs%5CR4-2107158.zip) | Big CR, to be further revised to capture agreements in this meeting. |
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## Discussion on 2nd round

Please only comment on topics that are selected for discussion in 2nd round.

**Sub-topic#1-1**

## Summary on 2nd round

# Topic #2: Measurement Accuracy Requirements for PRS RSTD (AI6.5.2.2.2.1)

## Companies’ contributions summary

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| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2108784**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2108784.zip) |  ZTE | **Proposal 1: For UE Rx-Tx and RSTD measurements in FR1, add a group delay calibration margin of 4 ns \* (100/BW), where BW is the PRS bandwidth in MHz, to the accuracy requirements.** |
| [**R4-2109093**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2109093.zip) | CATT | **Proposal 1: Define one set of requirements (i.e. do not define additional requirements for AWGN).** **Proposal 2: Test cases for accuracy requirements are defined for AWGN conditions.** **Proposal 3: Margin equals to zero if the reference and neighbouring resources are on the same frequency layer in FR1 and FR2.** **Proposal 4: Frequency drift margin is not needed.** **Proposal 5: The accuracy requirements for 60kHz in FR2 are defined the same as that for 120kHz.** **Proposal 6: Use the following template for defining RSTD measurement accuracy requirements in which X is the accuracy based on simulation results.** **Table 1: RSTD accuracy in FR1**

|  |  |  |  |
| --- | --- | --- | --- |
| **Accuracy,** **Tc** | **PRS BW,** **PRB** | **PRS SCS,****kHz** | **Repetition factor****(**$T\_{rep}^{PRS}\*L\_{PRS}/K\_{comb}^{PRS})$ |
| **±[X+Z]** | ≥[24] | 15 | ≥[4] |
| **±[X+Z]** | ≥[52] | All |
| **±[X+Z]** | >[104] | All |
| **±[X+Z]** | ≥[48] | 30,60 | All |
| Note: Z is the calibration margin. Z equals to zero when the reference and neighboring resources are on the same layer and equals to [32Tc] when they are on different layers.  |

**Table 2: RSTD accuracy in FR2**

|  |  |  |  |
| --- | --- | --- | --- |
| **Accuracy,****Tc** | **PRS BW,****PRB** | **PRS SCS,****kHz** | **Repetition factor****(**$T\_{rep}^{PRS}\*L\_{PRS}/K\_{comb}^{PRS})$ |
| **±[X+Z]** | ≥[24] | 60/120 | ≥[4] |
| **±[X+Z]** | ≥[64] | All |
| Note: Z is the calibration margin. Z equals to zero when the reference and neighboring resources are on the same layer and equals to [32Tc] when they are on different layers. |

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| [**R4-2109235**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2109235.zip) | Intel Corporation | ***Proposal 2: The requirements based on the different PRS measurement bandwidth can be:***

|  |  |  |  |
| --- | --- | --- | --- |
| **Accuracy,** **Tc** | **PRS BW,** **PRB** | **PRS SCS,****kHz** | **Repetition factor**  ***(***$T\_{rep}^{PRS}\*L\_{PRS}/K\_{comb}^{PRS})$ |
| [TBD] | ≥[24] | 15 | ≥4 |
| [TBD] | ≥[52] | All |
| [TBD] | >[104] | All |
| [TBD] | ≥[48] | 30,60 | All |
| [TBD] | ≥[132] | All |

***Proposal 3: RAN4 shall NOT define the additional requirements for AWGN channel.*** |
| [**R4-2109862**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2109862.zip) | Qualcomm Incorporated | **Proposal 1: RAN4 should define separate NR positioning measurement accuracy requirements for AWGN and fading propagation conditions.****Proposal 2: RAN4 will add a non-zero group delay calibration margin to the RSTD accuracy requirements in FR1 and FR2. FFS the exact values of the margins for FR1 and FR2.****Observation 2: The group delay calibration margin should scale inversely with PRS bandwidth.****Proposal 3: RAN4 should discuss the assumptions for UE frequency error and separation between PRS resources and decide on a frequency drift margin to be added to RSTD measurement requirements.****Proposal 4: Structure for RSTD accuracy requirements. The frequency ranges for each SCS may be modified based on finalized simulation results.**

|  |  |  |  |
| --- | --- | --- | --- |
| **Accuracy** **(Tc)** | **PRS BW** **(PRB)** | **PRS SCS****(kHz)** | **Repetition factor****(**$T\_{rep}^{PRS}\*L\_{PRS}/K\_{comb}^{PRS})$ |
| **[TBD]** | ≥ [24] | 15 | ≥ [4] |
| **[TBD]** | ≥ [52] | ≥ [1]  |
| **[TBD]** | ≥ [104] | ≥ [1] |
| **[TBD]** | ≥ [268] | ≥ [1] |
| **[TBD]** | ≥ [48] | 30 | ≥ [1] |
| **[TBD]** | ≥ [132] | ≥ [1] |
| **[TBD]** | ≥ [272] | ≥ [1] |
| **[TBD]** | ≥ [24] | 60 | ≥ [4] |
| **[TBD]** | ≥ [64] | ≥ [1] |
| **[TBD]** | ≥ [132] | ≥ [1] |

**Table 1: RSTD accuracy in FR1**

|  |  |  |  |
| --- | --- | --- | --- |
| **Accuracy** **(Tc)** | **PRS BW** **(PRB)** | **PRS SCS****(kHz)** | **Repetition factor****(**$T\_{rep}^{PRS}\*L\_{PRS}/K\_{comb}^{PRS})$ |
| **[TBD]** | ≥ [24] | 60 | ≥ [4] |
| **[TBD]** | ≥ [64] | ≥ [1]  |
| **[TBD]** | ≥ [132] | ≥ [1] |
| **[TBD]** | ≥ [24] | 120 | ≥ [4] |
| **[TBD]** | ≥ [32] | ≥ [4] |
| **[TBD]** | ≥ [64] | ≥ [1] |
| **[TBD]** | ≥ [128] | ≥ [1] |

Table 2: RSTD accuracy in FR2 |
| [**R4-2109938**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2109938.zip) | vivo | **Proposal 1: There is no need to define additional set of accuracy requirements for RSTD and UE Rx-Tx measurement under AWGN.****Proposal 2: Tests to verify RSTD and UE Rx-Tx accuracy requirements under fading channel can be considered if feasibility is possible in terms of TE complexity.***[Moderator notes: can be discussed in Topic #5]***Proposal 3: Add a non-zero group delay calibration margin to the RSTD accuracy requirements in FR1 and FR2****Proposal 4: Additional margin due to frequency drift for RSTD accuracy can be considered if it is necessary.****Proposal 5: The RSTD accuracy requirements are proposed as in Table 1a and Table 2a for FR1 and FR2 respectively.****Table 1a: RSTD accuracy requirements in FR1**

|  |  |  |  |
| --- | --- | --- | --- |
| **Accuracy,** **Tc** | **PRS BW,** **PRB** | **PRS SCS,****kHz** | **Repetition factor****(**$T\_{rep}^{PRS}\*L\_{PRS}/K\_{comb}^{PRS})$ |
| **[TBD]** | ≥[24] | 15 | ≥[4] |
| **[TBD]** | ≥[52] | All |
| **[TBD]** | >[104] | All |
| **[TBD]** | ≥[48] | 30 | All |
| **[TBD]** | ≥[132] | All |
| **[TBD]** | ≥[64] | 60 | All |

**Table 2a: RSTD accuracy requirements in FR2**

|  |  |  |  |
| --- | --- | --- | --- |
| **Accuracy,** **Tc** | **PRS BW,** **PRB** | **PRS SCS,****kHz** | **Repetition factor****(**$T\_{rep}^{PRS}\*L\_{PRS}/K\_{comb}^{PRS})$ |
| **[TBD]** | ≥[24] | 60 | ≥[4] |
| **[TBD]** | ≥[64] | All |
| **[TBD]** | ≥[32] | 120 | All |
| **[TBD]** | ≥[64] |  | All |

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| [**R4-2110125**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2110125.zip) | OPPO | **Proposal 1: Define single set of requirements for AWGN and fading conditions.****Proposal 2: Do not define test cases for fading conditions in FR1.****Proposal 3: The number of “1” in *MutingPattern-r16* for *mutingOption2-r16* should be used to calculate PRS resource repetition factor for RSTD accuracy.****Proposal 4: Discuss whether and how to calculate PRS resource repetition factor for RSTD accuracy when partial PRS resource repetitions are within MG.****Proposal 5: For RSTD measured with PRS resources with different SCSs, UE follows the accuracy requirements for the smaller SCS.****Proposal 6: For RSTD measured with PRS resources in different FR ranges, UE follows the accuracy requirements for FR1.****Observation 1: The following scenarios should be considered when defining PRS-RSTD accuracy requirements:*** **The PRS resources from reference cell and neighbour cell are configured with different SCSs.**
* **The PRS resources from reference cell and neighbour cell are configured in different FR ranges.**
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| [**R4-2110126**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2110126.zip) | OPPO | CR |
| [**R4-2110883**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2110883.zip) | Huawei, HiSilicon | **Proposal 1: Define two sets of requirements for AWGN and fading channel respectively.** **Proposal 2: For each set of requirements, capture in the specification the propagation channel model based on which the requirements are derived.****Proposal 3: RAN4 to consider the following tables for defining RSTD accuracy requirements. Some BW ranges can be merged, if the accuracy numbers are similar when considering the margins.****Table 1: Template for RSTD accuracy requirements FR1 with fading channel**

|  |  |  |  |
| --- | --- | --- | --- |
| **Accuracy (Tc)** | **PRB num** | **SCS (kHz)** | **Repetition**  |
|  | ≥24 | 15 | ≥4 |
|  | ≥52 | ≥1 |
|  | ≥104 | ≥1 |
|  | ≥[200] | ≥1 |
|  | ≥48 | 30 | ≥1 |
|  | ≥132 | ≥1 |
|  | ≥24 | 60 | ≥4 |
|  | ≥64 | ≥1 |

**Table 2: Template for RSTD accuracy requirements FR2 with fading channel**

|  |  |  |  |
| --- | --- | --- | --- |
| **Accuracy (Tc)** | **PRB num** | **SCS (kHz)** | **Repetition**  |
|  | ≥24 | 60 | ≥4 |
|  | ≥64 | ≥1 |
|  | ≥24 | 120 | ≥1 |
|  | ≥64 | ≥1 |

**Table 3: Template for RSTD accuracy requirements FR1 with AWGN channel**

|  |  |  |  |
| --- | --- | --- | --- |
| **Accuracy (Tc)** | **PRB num** | **SCS (kHz)** | **Repetition**  |
|  | ≥24 | 15 | ≥1 |
|  | ≥52 | ≥1 |
|  | ≥104 | ≥1 |
|  | ≥[200] | ≥1 |
|  | ≥48 | 30 | ≥1 |
|  | ≥132 | ≥1 |
|  | ≥[200] | ≥1 |
|  | ≥24 | 60 | ≥1 |
|  | ≥64 | ≥1 |
|  | ≥132 | ≥1 |

**Table 4: Template for RSTD accuracy requirements FR2 with AWGN channel**

|  |  |  |  |
| --- | --- | --- | --- |
| **Accuracy (Tc)** | **PRB num** | **SCS (kHz)** | **Repetition**  |
|  | ≥24 | 60 | ≥1 |
|  | ≥64 | ≥1 |
|  | ≥132 | ≥1 |
|  | ≥24 | 120 | ≥1 |
|  | ≥64 | ≥1 |
|  | ≥128 | ≥1 |

**Proposal 4: Add a non-zero group delay calibration margin to the RSTD accuracy requirements in FR1 and FR2, regardless if the reference resource and neighbor resource are on the same PFL or not.****Proposal 5: Add a margin of +/-32Tc for RSTD accuracy requirements, provided that the separation between the reference resource and the neighbor resource is within 160ms.** |
| [**R4-2110884**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2110884.zip) | Huawei, HiSilicon | Draft CR |
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## Open issues summary and companies’ views collection for 1st round

### Sub-topic 2-1 Applicable propagation channel for accuracy requirement

[*Moderator notes: In the last meeting, the following agreements were achieved.*

* + - *PRS-RSTD and UE Rx-Tx measurement accuracy requirements*
			* *Requirements for fading conditions shall be defined*
			* *FFS: Additional set of requirements for AWGN*
		- *Test cases for accuracy requirements are defined for*
			* *AWGN conditions*
			* *FFS: fading conditions for FR1*

*Hereby, we would like to focus on the requirements sets needed.*

* + - * *FFS: Additional set of requirements for AWGN*

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* Option 1 (vivo, Intel, OPPO).
	+ No need to define the additional accuracy requirement for AWGN
* Option 2 (Qualcomm):
	+ Define separated set requirements for AWGN beside the requirements for the fading channels
* Option 2a (Huawei):
	+ Define additional set requirements for AWGN
	+ Captured in the specification the propagation channel models based on which the accuracy requirements are derived

Recommended WF: Regarding to the timeline and no real estimation error can be identified under AWGN, can we agree the following proposal.

*“Proposal*: Only *requirements for fading conditions will be defined for NR RSTD and UE Rx-Tx time difference measurement accuracy in Rel16. “*

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| **Company** | **Comments** |
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### Sub-topic 2-2 Applicability of accuracy requirement

#### Sub-topic 2-2-1 Applicable accuracy requirement in case of PRS resources with different SCSs

* Option 1 (OPPO)
	+ For RSTD measured with PRS resources with different SCSs, UE follows the accuracy requirements for the smaller SCS.

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

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| **Company** | **Comments** |
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#### Sub-topic 2-2-2 Applicable accuracy requirement in case of PRS resources in different FRs

* Option 1 (OPPO)
	+ *For RSTD measured with PRS resources in different FR ranges, UE follows the accuracy requirements for FR1.*

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

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| **Company** | **Comments** |
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### Sub-topic 2-3 Group delay calibration margin

* Option 1(Huawei, Qualcomm, vivo) RAN4 will add a non-zero group delay calibration margin to the RSTD accuracy requirements in FR1 and FR2.
	+ FFS the exact values of the margins for FR1 and FR2.
* Option 1a( Qualcomm, ZTE): The group delay calibration margin should scale inversely with PRS bandwidth.
* Option 2(CATT) :
	+ Margin equals to zero if the reference and neighbouring resources are on the same frequency layer in FR1 and FR2.
	+ Margin equals to [32Tc] when they are on different layers.

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

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| --- | --- |
| **Company** | **Comments** |
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### Sub-topic 2-4 Frequency drift margin

* Option 1 (Qualcomm, vivo): Additional frequency drift margin shall be added to RSTD measurement requirements.
* Option 1a(Huawei): Add a margin of +/-32Tc for RSTD accuracy requirements, provided that the separation between the reference resource and the neighbor resource is within 160ms
* Option 2(CATT): No frequency drift margin needed**.**

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

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| **Company** | **Comments** |
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### Sub-topic 2-5 RSTD accuracy requirements for FR1/FR2

*[Moderator notes:*

***Background****: In the last meeting the RSTD accuracy requirement can be defined with table below.*

**Table 1: RSTD accuracy in FR1**

|  |  |  |  |
| --- | --- | --- | --- |
| **Accuracy,** **Tc** | **PRS BW,** **PRB** | **PRS SCS,****kHz** | **Repetition factor**  ***(***$T\_{rep}^{PRS}\*L\_{PRS}/K\_{comb}^{PRS})$ |
| [TBD] | ≥[24] | 15 | ≥4 |
| [TBD] | ≥[52] | All |
| [TBD] | >[104] | All |
| [TBD] | ≥[48] | 30,60 | All |

**Table 2: RSTD accuracy in FR2**

|  |  |  |  |
| --- | --- | --- | --- |
| **Accuracy,** **Tc** | **PRS BW,** **PRB** | **PRS SCS,****kHz** | **Repetition factor**  ***(***$T\_{rep}^{PRS}\*L\_{PRS}/K\_{comb}^{PRS})$ |
| TBD | ≥[24] | 60/120 | ≥4 |
| [TBD] | ≥[64] | All |

*The other two open issues are:*

* *FFS: The requirements for SCS=60k in FR2*
* *FFS: The number of PRS BW ranges for each SCS*

*Based on the collected simulation results in this meeting [R4-2109238], the performance requirements for the difference SCS with the similar PRS BW(one PRS BW group) and repetition factor can be summarized below.*

* *For AWGN:*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **FR** | **PRS BW (PRBs)** | **SCS(kHz)** | **rep** | **Requirement(Tc)** |
| **Intel** | **Ericsson** | **vivo** | **Huawei** | **QC** | **CATT** | **OPPO** | **avg** |
| FR1 | 24 | 15 | 1 | 109 | 99 | 109 | 294 | 322 |   |   | **186** |
| 24 | 15 | 4 | 107 | 104 | 186 | 186 | 322 |   |   | **181** |
| 24 | 60 | 4 | 51 | 43 | 70 | 70 |   |   |   | **59** |
| 52 | 15 | 1 | 94 | 106 | 95 | 95 | 132 |   |   | **104** |
| 48 | 30 | 1 | 49 | 46 | 49 | 49 | 68 |   |   | **52** |
| 64 | 60 | 1 | 37 | 25 | 23 | 23 |   |   |   | **27** |
| 104 | 15 | 1 | 24 | 46 | 43 | 44 | 59 |   |   | **43** |
| 132 | 30 | 1 | 24 | 25 | 22 | 23 | 27 |   |   | **24** |
| 132 | 60 | 1 |   | 11 | 11 | 11 |   |   |   | **11** |
| 268 | 15 | 1 | 44 | 25 | 16 | 0 | 21 |   |   | **21** |
| 272 | 30 | 1 | 13 | 11 | 11 | 11 | 11 |   |   | **11** |
| FR2 | 24 | 60 | 1 | 29 | 24 | 81 | 81 |   |   |   | **54** |
| 24 | 120 | 1 | 13 | 17 | 37 | 37 | 42 |   |   | **29** |
| 64 | 60 | 1 | 46 | 25 | 22 | 23 |   |   |   | **29** |
| 64 | 120 | 1 | 14 | 76 | 11 | 11 | 15 |   |   | **25** |
| 132 | 60 | 1 | 28 | 11 | 11 | 11 |   |   |   | **15** |
| 128 | 120 | 1 | 6 | 6 | 4 |   | 8 |   |   | **6** |
| Note 1: **PRS\_NormLenthPerSlot = (DL-PRS-NumSymbols x DL-PRS\_ResourceRepetitionFactor) /DL-PRS-CombSizeN**Note 2: **The number of samples for accuarcy requirements is 4.** |
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*From the results summarized above we can see.*

* *For fading channel :*

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| --- | --- | --- | --- | --- | --- |
| **FR** | **PRS BW**  | **PRS BW (PRBs)** | **SCS(kHz)** | **rep** | **RSTD accuracy Requirement(Tc)** |
|  | **Intel** | **Ericsson** | **vivo** | **HW** | **QC** | **CATT** | **OPPO** | **avg** |
| FR1 | group 1 | 24 | 15 | 4 | 234 |   | 112 | 288 | 260 |   |   | **224** |
| 24 | 60 | 4 | 252 | 50 | 43 | 189 |   |   |   | **134** |
| group 2 | 52 | 15 | 1 | 147 | 87 | 90 | 148 | 166 | 300 | 64 | **143** |
| 48 | 30 | 1 | 118 | 51 | 56 | 144 | 75 | 322 | 96 | **123** |
| 64 | 60 | 1 | 48 | 23 | 20 | 29 |   |   |   | **30** |
| group 3 | 104 | 15 | 1 | 102 | 50 | 42 | 84 | 74 | 126 | 64 | **77** |
| 132 | 30 | 1 | 48 | 22 | 18 | 24 | 24 | 63 | 16 | **31** |
| 132 | 60 | 1 | 39 | 14 | 10 | 19 |   |   |   | **20** |
| group 4 | 268 | 15 | 1 | 26 | 22 | 17 | 24 | 28 | 39 | 16 | **24** |
| 272 | 30 | 1 | 36 | 14 | 9 | 18 | 15 |   | 16 | **18** |
| FR2 | group 1-1 | 24 | 60 | 1 | 138 | 44 | 117 | 813 |   |   |   | **278** |
| 24 | 120 | 1 | 67 | 141 | 78 | 444 | 831 |   |   | **312** |
| group 1-2 | 24 | 60 | 4 | 60 | 42 | 45 | 205 |   |   |   | **88** |
| group 2 | 64 | 60 | 1 | 69 | 67 | 32 | 60 |   |   |   | **57** |
| 64 | 120 | 1 | 47 | 35 | 39 | 62 | 64 |   | 48 | **49** |
| group 3 | 132 | 60 | 1 | 26 | 36 | 32 | 56 |   |   |   | **37** |
| 128 | 120 | 1 | 41 | 9 | 31 |   | 55 |   | 12 | **30** |

*From the results summarized above we can see.*

*Observation 1: Under AWGN condition, the accuracy with the different SCS are different because of the quantitation error depending on the sampling rate.*

 *Observation 2: Under fading condition, the accuracy with the different SCS can be similar for some PRS BW and SCS combinations.*

*Therefore, could we agree the proposal below.*

***Proposal 1: RSTD accuracy requirements under the fading channels can be:***

**Table 1: RSTD accuracy in FR1**

|  |  |  |  |
| --- | --- | --- | --- |
| **Accuracy,** **Tc** | **PRS BW,** **PRB** | **PRS SCS,****kHz** | **Repetition factor**  ***(***$T\_{rep}^{PRS}\*L\_{PRS}/K\_{comb}^{PRS})$ |
| [224+margin] | ≥[24] | 15 | ≥4 |
| [143+margin] | ≥[52] | All |
| [77+margin] | >[104] | All |
| [123+margin] | ≥[48] | 30 | All |
| [143+margin] | ≥[64] | 60 | All |
| [31+margin] | ≥[132] | 30/ 60 | All |

**Table 2: RSTD accuracy in FR2**

|  |  |  |  |
| --- | --- | --- | --- |
| **Accuracy,** **Tc** | **PRS BW,** **PRB** | **PRS SCS,****kHz** | **Repetition factor**  ***(***$T\_{rep}^{PRS}\*L\_{PRS}/K\_{comb}^{PRS})$ |
| [88+margin] | ≥[24] | 60/120 | ≥4 |
| [57+margin] | ≥[64] | All |
| [37+margin] | ≥[132] | All |

***Proposal 2: If AWGN requirements shall be defined , RSTD accuracy requirements under the fading channels can be:***

**Table 1: RSTD accuracy in FR1**

|  |  |  |  |
| --- | --- | --- | --- |
| **Accuracy,** **Tc** | **PRS BW,** **PRB** | **PRS SCS,****kHz** | **Repetition factor**  ***(***$T\_{rep}^{PRS}\*L\_{PRS}/K\_{comb}^{PRS})$ |
| [181+margin] | ≥[24] | 15 | ≥4 |
| [104+margin] | ≥[52] | All |
| [43+margin] | >[104] | All |
| [TBD+margin] | ≥[24] | 30 | ≥4 |
| [52+margin] | ≥[48] | All |
| [24+margin] | ≥[132] | All |
| [59+margin] | ≥[24] | 60 | ≥4 |
| [27+margin] | ≥[64] | All |
| [11+margin] | ≥[132] | All |

**Table 2: RSTD accuracy in FR2**

|  |  |  |  |
| --- | --- | --- | --- |
| **Accuracy,** **Tc** | **PRS BW,** **PRB** | **PRS SCS,****kHz** | **Repetition factor**  ***(***$T\_{rep}^{PRS}\*L\_{PRS}/K\_{comb}^{PRS})$ |
| [54+margin] | ≥[24] | 60 | All |
| [29+margin] | ≥[64] | All |
| [15+margin] | ≥[132] | All |
| [29+margin] | ≥[24] | 120 | All |
| [25+margin] | ≥[64] |  | All |
| [6+margin] | ≥[132] |  | All |

*]*

#### Sub-topic 2-5-1 Whether the separated requirements needed for each SCS

* Option 1 (Huawei, Qualcomm, vivo): Yes.
* Option 1a (Intel): Yes for the requirements of AWGN only if needed.
* Option 2 (Intel): No

Recommended WF: Check the proposals above can be agreeable for companies.

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| **Company** | **Comments** |
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#### Sub-topic 2-5-2 PRS BW ranges for the requirements of fading channel

* Option 1 (Intel):
	1. ≥132, SCS =30/60KHz in FR1
* Option 2 (Qualcomm)
	1. ≥132, SCS =30KHz in FR1
	2. ≥[272], SCS =30 KHz in FR1 [*Moderator Notes: for 30k SCS, the maximum PRS BW is 272*.]
	3. ≥[24], SCS =60 KHz in FR1
	4. ≥[64], SCS =60 KHz in FR1
	5. ≥[132], SCS =60 KHz in FR1
	6. ≥[132], SCS =60 KHz in FR2
	7. ≥[32], SCS =120 KHz in FR1
	8. ≥[128], SCS =120 KHz in FR2
* Option 3 (vivo):
	1. ≥132, SCS =30KHz in FR1
	2. ≥[64], SCS =60 KHz in FR1
	3. ≥32, SCS =120 KHz in FR2
* Option 4 (Huawei):
	1. ≥132, SCS =30KHz in FR1
	2. ≥[200], SCS =15 KHz in FR1
	3. ≥[24], SCS =60 KHz in FR1
	4. ≥24, SCS =120 KHz in FR2

Recommended WF: Check the proposals above can be agreeable for companies.

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| **Company** | **Comments** |
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#### Sub-topic 2-5-3 PRS BW ranges for the requirements of AWGN

*[Moderator notes: this is up to the sub-topic 2-2.*

*Technically speaking, the accuracy of AWGN is dominated by the minimum sampling rate UE required. That is the different PRS BW and SCS combination may lead the different requirement sets.]*

* Option 1 (Huawei)
* **Table 3: Template for RSTD accuracy requirements FR1 with AWGN channel**

|  |  |  |  |
| --- | --- | --- | --- |
| **Accuracy (Tc)** | **PRB num** | **SCS (kHz)** | **Repetition**  |
|  | ≥24 | 15 | ≥1 |
|  | ≥52 | ≥1 |
|  | ≥104 | ≥1 |
|  | ≥[200] | ≥1 |
|  | ≥48 | 30 | ≥1 |
|  | ≥132 | ≥1 |
|  | ≥[200] | ≥1 |
|  | ≥24 | 60 | ≥1 |
|  | ≥64 | ≥1 |
|  | ≥132 | ≥1 |

* **Table 4: Template for RSTD accuracy requirements FR2 with AWGN channel**

|  |  |  |  |
| --- | --- | --- | --- |
| **Accuracy (Tc)** | **PRB num** | **SCS (kHz)** | **Repetition**  |
|  | ≥24 | 60 | ≥1 |
|  | ≥64 | ≥1 |
|  | ≥132 | ≥1 |
|  | ≥24 | 120 | ≥1 |
|  | ≥64 | ≥1 |
|  | ≥128 | ≥1 |

Recommended WF: Check the proposals above can be agreeable for companies.

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| **Company** | **Comments** |
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#### Sub-topic 2-5-4 Muting pattern and repetition factor

* Option 1(OPPO):
	+ The number of “1” in MutingPattern-r16 for mutingOption2-r16 should be used to calculate PRS resource repetition factor for UE Rx-Tx time difference accuracy.
	+ Discuss whether and how to calculate PRS resource repetition factor for RSTD accuracy when partial PRS resource repetitions are within MG.

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

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| **Company** | **Comments** |
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### CRs/TPs

[*Moderator notes: suggest take one of these CR drafts as the baseline which can be revised in 2nd round discussion*.]

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| **CR/TP number** | **Comments collection** |
| [**R4-2110884**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2110884.zip) (Huawei, Hi Silicon) |  |
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| [**R4-2110126**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2110126.zip)(OPPO) |  |
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## Summary for 1st round (TBD)

### Open issues

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|  | **Status summary**  |
| **Sub-topic#2-1** | **Applicable accuracy requirement in case of HO and other serving cell changes***Tentative agreements:* *Candidate options:**Recommendations for 2nd round: No further discussion needed.* |
| **Sub-topic#2-2** | **Applicable propagation channel for accuracy requirement***Tentative agreements:**GTW agreements:**Candidate options:**Recommendations for 2nd round: Can be FFS* |
| **Sub-topic#2-3** | **How to define the accuracy requirements with the combinations of PRS BW, repetitions and others***Tentative agreements: None.**Candidate options:**Recommendations for 2nd round: Can be FFS* |
| **Sub-topic#2-4** | **Group delay calibration margin***Tentative agreements:* *Candidate options:**Recommendations for 2nd round: Can be FFS in next meeting* |
| **Sub-topic#2-5** | **Frequency drift margin***Tentative agreements:None**Candidate options:**Recommendations for 2nd round: Can be FFS in the next meeting.* |
| **Sub-topic#2-6** | **RSTD accuracy requirements for FR1/FR2***Moderator Notes:**Tentative agreements:**Candidate options:**Recommendations for 2nd round: as discussed in GTW, firstly we can continue discussion on alignment. How to structure the requirements can be identified based on averaged results.* |

### CRs/TPs

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| **CR/TP number** | **CRs/TPs Status update recommendation**  |
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## Discussion on 2nd round

Please only comment on topics that are selected for discussion in 2nd round.

## Summary on 2nd round

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| **CR/TP/LS/WF number** | **T-doc status update recommendation**  |
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# Topic #3: Measurement Accuracy Requirements for PRS RSRP (AI6.5.2.2.2.2)

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2109094**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2109094.zip) | CATT | **Proposal 1: The relative RSRP accuracy should be (RSRP95 – RSRP05)/2.** **Proposal 2: The PRS RSRP measurement requirements in extreme condition are X dB larger than that in normal condition, and X is:** * **3dB for absolute accuracy for FR1.**
* **3dB for absolute accuracy for FR2.**
* **1dB for relative accuracy for FR1.**
* **3dB for relative accuracy for FR2.**
 |
| [**R4-2109096**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2109096.zip) | CATT | CR |
| [**R4-2109863**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2109863.zip) | Qualcomm Incorporated | **Proposal 1: RAN4 needs to consider the following** **questions before deciding the calibration error margin for relative accuracy requirements:**1. **Whether relative accuracy requirements would apply to any two PRS-RSRP measurements reported for any positioning method using either absolute report mapping or differential report mapping.**
2. **Whether relative accuracy requirements would apply to any two PRS-RSRP measurements corresponding to PRS resources from different TRPs.**
3. **Whether relative accuracy requirements would apply to any two PRS-RSRP measurements made in different PFLs or in the same PFL.**
4. **Whether relative accuracy requirements would apply to any two PRS-RSRP measurements made in different FRs.**
5. **Whether relative accuracy requirements would apply to any two PRS-RSRP measurements made in the same PFL with different Rx antennas/paths.**
6. **Whether relative accuracy requirements would apply to any two PRS-RSRP measurements with a large difference in RSRP levels (different AGC) in the same PFL.**
7. **Whether relative accuracy requirements would apply to any two PRS-RSRP measurements made with different Rx beams in FR2.**

**Observation 1: Rx beam indication is only provided in certain cases for PRS-RSRP measurements reported for DL-AoD.****Proposal 2: If PRS-RSRP relative accuracy requirements apply only between two DL-AoD measurements performed on PRS resources from the same DL-PRS Resource Set and measured with the same Rx Beam, then a smaller calibration margin may be considered.****Proposal 3: Structure for PRS-RSRP accuracy requirements. Tentative accuracy numbers do not include RF calibration margins. The frequency ranges for each SCS may be modified based on finalized simulation results.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Absolute** **Accuracy****(dB)** | **Relative** **Accuracy****(dB)** | **Es/Iot****(dB)** | **PRS BW** **(PRB)** | **PRS SCS****(kHz)** | **Repetition factor:**$(T\_{rep}^{PRS}\*L\_{PRS}/K\_{comb}^{PRS})$**[38.211]** |
| **[TBD]** | [TBD] | -3 | ≥ [24] | 15, 30, 60 | ≥ [1] |
| **[±6.5]** | [TBD]  | -13 | ≥ [24] | 15, 30, 60 | ≥ [4] |
| **[±3.5]** | [TBD]  | ≥ [64] | 15, 30, 60 | ≥ [1] |
| **[±3]** | [TBD] | ≥ [104] | 15, 30, 60 | ≥ [1] |

Table 3: PRS-RSRP accuracy in FR1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Absolute** **Accuracy****(dB)** | **Relative** **Accuracy****(dB)** | **Es/Iot****(dB)** | **PRS BW** **(PRB)** | **PRS SCS****(kHz)** | **Repetition factor:**$(T\_{rep}^{PRS}\*L\_{PRS}/K\_{comb}^{PRS})$**[38.211]** |
| **[TBD]** | [TBD] | -3 | ≥ [24] | 60, 120 | ≥ [1] |
| **[±5]** | [TBD] | -13 | ≥ [24] | 60, 120 | ≥ [4] |
| **[±3]** | [TBD] | ≥ [64] | 60, 120 | ≥ [1] |

Table 4: PRS-RSRP accuracy in FR2 |
| [**R4-2109939**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2109939.zip) | vivo | **Proposal 1: For PRS-RSRP measurement from one TRP and PRS-RSRP measurement from another TRP on the same PFL in FR1, or PRS-RSRP measurements between any two PRS-RSRP levels on the same TRP in FR1, no RF calibration margin is added in the relative accuracy requirements.****Proposal 2: For PRS-RSRP measurements from one TRP on one PFL in FR1 and PRS-RSRP measurements from another TRP on a different PFL in FR1, 2.5dB RF calibration margin is added in the relative accuracy requirements.****Proposal 3: For all PRS-RSRP measurements in FR2, 4dB RF calibration margin is added in the relative accuracy requirements.****Proposal 4: Antenna gain and beamforming gain uncertainty for PRS-RSRP measurement in FR2 are accounted in the test.****Proposal 5: Gain to PRS-RSRP measurement point in FR2 is caputred in clause B.2.1.6.****Proposal 6: PRS-RSRP accuracy requirements strucutre as in Table 1 and Table 2 for FR1 and FR2 respectively are used as baseline. Furhter changes can be made based on updated simulation results.** |
| [**R4-2109940**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2109940.zip) | vivo | CR to 38.133 Introduction of Gain to PRS-RSRP measurement point for FR2 in Annex B |
| [R4-2109941](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_99-e/Docs/R4-2109941.zip) | vivo |  |
| [**R4-2110127**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2110127.zip) | OPPO | **Observation 1: Relative SS-RSRP accuracy could apply to SS-RSRP measured from different cells.****Observation 2: Relative SS-RSRP accuracy could apply to SS-RSRP measured from cells in different frequencies in the same FR range.****Observation 3: A restriction on difference between SS-RSRP levels is introduced for inter-frequency relative SS-RSRP accuracy requirements.****Observation 4: Relative SS-RSRP accuracy requirements apply to any two SS-RSRP measurements, no matter they are made with same or different Rx antenna/beam.****Proposal 1: Relative PRS-RSRP accuracy requirements apply to any two PRS-RSRP:*** **The PRS-RSRP could be measured from the same TRP or different TRPs,**
* **The PRS-RSRP could be measured in the same PFL or different PFLs,**
* **The PRS-RSRP could be measured in the same FR range,**
* **The difference between two PRS-RSRP should be no larger than X, |PRS\_RP1dBm - PRS\_RP2dBm| ≤ X dB**
	+ **FFS: the value of X**

**Proposal 2: The RF margin for relative PRS-RSRP accuracy requirements is defined as:*** **[0] dB for PRS-RSRP measured in the same PFL in FR1**
* **[2.5] dB for PRS-RSRP measured in different PFLs in FR1**
* **[4] dB for PRS-RSRP measured in the same PFL in FR2**
* **[4] dB for PRS-RSRP measured in different PFLs in FR2**

**Proposal 3: The following rules should be considered for relative PRS-RSRP accuracy requirements:*** **The parameter PRS Es/Iot is the minimum PRS Es/Iot of the pair of TRPs to which the requirement applies.**
* **The parameter PRS BW is the minimum PRS BW of the pair of PRS resources to which the requirement applies.**
 |
| [**R4-2110885**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2110885.zip) | Huawei, HiSilicon | **Proposal 1: Confirm the PRS BW ranges in [1].****Proposal 2: Relative PRS-RSRP accuracy requirements only apply for PRS-RSRP measured from resources in the same resource set, and with same Rx beam in case of FR2.****Proposal 3: Add a margin of 2dB for FR1 and 4dB for FR2 for relative PRS-RSRP accuracy requirements.** |

## Open issues summary and companies’ views collection for 1st round

### Sub-topic 3-1 Relative PRS-RSRP requirements definition

[*Moderator notes: in last meeting that relative RSRP accuracy = (RSRP95 – RSRP05), where RSRPX is the RSRP error value for X-%-tile CDF point. But some concerns on this definition raised in this meeting* ]

Candidate options:

* Option 1 (CATT): The relative RSRP accuracy should be (RSRP95 – RSRP05)/2.

Recommended WF: Further discussion needed. Collect companies’ views

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| **Company** | **Comments** |
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### Sub-topic 3-2 RSRP requirements under the extreme conditions

* Option 1a (CATT). The PRS RSRP measurement requirements in extreme condition are X dB larger than that in normal condition, and X is:
	+ 3dB for absolute accuracy for FR1.
	+ 3dB for absolute accuracy for FR2.
	+ 1dB for relative accuracy for FR1.
	+ 3dB for relative accuracy for FR2
* .

Recommended WF: Further discussion needed. Collect companies’ views

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| **Company** | **Comments** |
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### Sub-topic 3-3 RF calibration margin for the relative accuracy requirements

[*Moderator notes: in [], some basic principle which can help us to understand and define the RF calibration margin for the relative PRS RSRP accuracy requirement.*

* + *RAN4 needs to consider the following questions before deciding the calibration error margin for relative accuracy requirements:*
		1. *Whether relative accuracy requirements would apply to any two PRS-RSRP measurements reported for any positioning method using either absolute report mapping or differential report mapping.*
		2. *Whether relative accuracy requirements would apply to any two PRS-RSRP measurements corresponding to PRS resources from different TRPs.*
		3. *Whether relative accuracy requirements would apply to any two PRS-RSRP measurements made in different PFLs or in the same PFL.*
		4. *Whether relative accuracy requirements would apply to any two PRS-RSRP measurements made in different FRs.*
		5. *Whether relative accuracy requirements would apply to any two PRS-RSRP measurements made in the same PFL with different Rx antennas/paths.*
		6. *Whether relative accuracy requirements would apply to any two PRS-RSRP measurements with a large difference in RSRP levels (different AGC) in the same PFL.*
		7. *Whether relative accuracy requirements would apply to any two PRS-RSRP measurements made with different Rx beams in FR2.*

Therefore, we can decouple this issue to the separated two sub issues below.

]

#### Sub-topic 3-3-1 Applicability of the relative PRS RSRP accuracy requirements

Candidate options:

* Option 1 (vivo):
	+ For PRS-RSRP measurement from one TRP and PRS-RSRP measurement from another TRP on the same PFL in FR1, or PRS-RSRP measurements between any two PRS-RSRP levels on the same TRP in FR1, no RF calibration margin is added in the relative accuracy requirements.
	+ For PRS-RSRP measurements from one TRP on one PFL in FR1 and PRS-RSRP measurements from another TRP on a different PFL in FR1, 2.5dB RF calibration margin is added in the relative accuracy requirements.
	+ For all PRS-RSRP measurements in FR2, 4dB RF calibration margin is added in the relative accuracy requirements.
	+ Antenna gain and beamforming gain uncertainty for PRS-RSRP measurement in FR2 are accounted in the test.
* Option 3. (Huawei):
	+ Relative PRS-RSRP accuracy requirements only apply for PRS-RSRP measured from resources in the same resource set, and with same Rx beam in case of FR2.
* Option 4(OPPO):
	+ Relative PRS-RSRP accuracy requirements apply to any two PRS-RSRP:
		- The PRS-RSRP could be measured from the same TRP or different TRPs,
		- The PRS-RSRP could be measured in the same PFL or different PFLs,
		- The PRS-RSRP could be measured in the same FR range,
		- The difference between two PRS-RSRP should be no larger than X, |PRS\_RP1dBm - PRS\_RP2dBm| ≤ X dB
			* FFS: the value of X
	+ The following rules should be considered for relative PRS-RSRP accuracy requirements:
		- The parameter PRS Es/Iot is the minimum PRS Es/Iot of the pair of TRPs to which the requirement applies.
		- The parameter PRS BW is the minimum PRS BW of the pair of PRS resources to which the requirement applies.

Recommended WF: Further discussion needed. Collect companies’ views

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| **Company** | **Comments** |
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#### Sub-topic 3-3-2 RF calibration margin for the relative accuracy requirements

Candidate options:

* Option 1 (Qualcomm): Can be FFS
* Option 2(vivo):
	+ For PRS-RSRP measurement from one TRP and PRS-RSRP measurement from another TRP on the same PFL in FR1, or PRS-RSRP measurements between any two PRS-RSRP levels on the same TRP in FR1, no RF calibration margin is added in the relative accuracy requirements.
	+ For PRS-RSRP measurements from one TRP on one PFL in FR1 and PRS-RSRP measurements from another TRP on a different PFL in FR1, 2.5dB RF calibration margin is added in the relative accuracy requirements.
	+ For all PRS-RSRP measurements in FR2, 4dB RF calibration margin is added in the relative accuracy requirements.
	+ Antenna gain and beamforming gain uncertainty for PRS-RSRP measurement in FR2 are accounted in the test.
* Option 3. (Huawei):
	+ Add **a margin of 2dB for FR1 and 4dB for FR2 for relative PRS-RSRP accuracy requirements**
	+ Relative PRS-RSRP accuracy requirements only apply for PRS-RSRP measured from resources in the same resource set, and with same Rx beam in case of FR2.
* Option 4(OPPO):
	+ The RF margin for relative PRS-RSRP accuracy requirements is defined as:
		- [0] dB for PRS-RSRP measured in the same PFL in FR1
		- [2.5] dB for PRS-RSRP measured in different PFLs in FR1
		- [4] dB for PRS-RSRP measured in the same PFL in FR2
		- [4] dB for PRS-RSRP measured in different PFLs in FR2
	+ Relative PRS-RSRP accuracy requirements apply to any two PRS-RSRP:
		- The PRS-RSRP could be measured from the same TRP or different TRPs,
		- The PRS-RSRP could be measured in the same PFL or different PFLs,
		- The PRS-RSRP could be measured in the same FR range,
		- The difference between two PRS-RSRP should be no larger than X, |PRS\_RP1dBm - PRS\_RP2dBm| ≤ X dB
			* FFS: the value of X
	+ The following rules should be considered for relative PRS-RSRP accuracy requirements:
		- The parameter PRS Es/Iot is the minimum PRS Es/Iot of the pair of TRPs to which the requirement applies.
		- The parameter PRS BW is the minimum PRS BW of the pair of PRS resources to which the requirement applies.

Recommended WF: Further discussion needed. Collect companies’ views

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| **Company** | **Comments** |
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### Sub-topic 3-4 PRS RSRP accuracy requirements

*[Moderator notes: PRS-RSRP accuracy requirements agreed in the last meeting can be taken as the baseline, which can be updated up to updated simulation results and agreed margin.]*

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| **Company** | **Comments** |
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###  CRs/TPs

[Moderator notes: suggest take one of these CR drafts as the baseline which can be revised in 2nd round discussion.]

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| **CR/TP number** | **Comments collection** |
|  [**R4-2109096**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2109096.zip) **(CATT)**  |  |
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|  **[R4-2109940](file:///C%3A%5C%5CUsers%5C%5Crhuang5%5C%5COneDrive%20-%20Intel%20Corporation%5C%5CDocuments%5C%5Cmy_work%5C%5CLTE_A%5C%5CRAN4%5C%5C99e%5C%5CDocs%5C%5CR4-2109096.zip) (vivo)**  |  |
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## Summary for 1st round (TBD)

### Open issues

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|  | **Status summary**  |
| **Sub-topic#3-1** | *Tentative agreements:* *Candidate options:**Recommendations for 2nd round: No further discussion.*  |
| **Sub-topic#3-2** | **How to define the accuracy requirements with the combinations of PRS BW and repetitions** *Tentative agreements:**Candidate options:**Recommendations for 2nd round: Please companies check the tentative agreements is acceptable.* |
| **Sub-topic#3-3** | **RF margin***Tentative agreements:**Candidate options:**Recommendations for 2nd round. No further discussion needed in this meeting.* |
| **Sub-topic#3-4** | **PRS RSRP accuracy requirements***Tentative agreements:**Candidate options:**Recommendations for 2nd round:* |

### CRs/TPs

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| **CR/TP number** | **CRs/TPs Status update recommendation**  |
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## Discussion on 2nd round

Please only comment on topics that are selected for discussion in 2nd round.

## Summary on 2nd round

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| **CR/TP/LS/WF number** | **T-doc status update recommendation**  |
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# Topic #4: Measurement Accuracy Requirements for UE Rx-Tx Time Difference (AI5.5.2.2.2.3)

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2108782**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2108782.zip) | ZTE Corporation | **Proposal 1: UE Rx-Tx measurement accuracy requirements shall not apply if the uplink transmission timing changes during the UE Rx-Tx measurement period due to autonomous adjustment or based on network-configured** |
| [**R4-2109095**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2109095.zip) | CATT | **Proposal 1: No need to clarify the applicability of UE Rx-Tx accuracy requirements in case of NTA\_offset change.** **Proposal 2: Capture in the specification that UE Rx-Tx accuracy requirements do not apply in case the UE UL timing changes during the measurement period.** **Proposal 3: Accuracy requirements apply in the case of serving cell change, provided that the serving cell change does not impact the UL timing. No need to capture this in the spec.**  |
| [**R4-2109237**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2109237.zip) | Intel Corporation | ***Proposal 1 : UE Rx-Tx measurement requirements in TS38.133 shall be applicable unless the NTA\_offset changes during the measurement period.******Proposal 3: The accuracy requirements of UE Rx-Tx time difference can be defined by the table below***.Table 1. UE Rx-Tx time difference accuracy requirements in FR1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Accuracy,** **Tc** | **Es/Iot,** **dB** | **PRS BW,** **PRB** | **PRS SCS,****kHz** | **Repetition factor**$(T\_{rep}^{PRS}\*L\_{PRS}/K\_{comb}^{PRS})$**[38.211]** |
| **[TBD]** | **-3** | **≥[24]** | **15** | **≥[4]** |
| **[TBD]** | **≥[52]** | **All** |
| **[TBD]** | **>[104]** | **All** |
| **[TBD]** | **≥[48]** | **30,60** | **All** |
| **[TBD]** | **≥132** | **All** |
| **[TBD]** | **-13** | **≥[24]** | **15** | **All** |
| **[TBD]** | **≥[52]** | **All** |
| **[TBD]** | **>[104]** | **All** |
| **[TBD]** | **≥[48]** | **30,60** | **All** |
| **[TBD]** | **≥132** | **All** |

Table 2. UE Rx-Tx time difference accuracy requirements in FR2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Accuracy,****Tc** | **Es/Iot,****dB** | **PRS BW,****PRB** | **PRS SCS,****kHz** | **Repetition factor**$$(T\_{rep}^{PRS}\*L\_{PRS}/K\_{comb}^{PRS})$$**[38.211]** |
| **[TBD]** | -3 | ≥[24] | 60/120 | ≥[4] |
| **[TBD]** | ≥[64] | All |
| **[TBD]** | -13 | ≥[24] | 60/120 | All |
| **[TBD]** | ≥[64] |  | All |

 |
| [**R4-2109864**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2109864.zip) | Qualcomm Incorporated | **Proposal 1: Clarify in section 10.1.25.2 in TS 38.133: “UE Rx-Tx time difference accuracy requirements shall not apply if NTA\_offset defined in Table 7.1.2-2 in 38.133 changes during the UE Rx-Tx measurement period.”****Proposal 2a: UE Rx-Tx measurement accuracy requirements shall not apply if the uplink transmission timing changes during the UE Rx-Tx measurement period due to network-configured TA command.****Proposal 2b: UE Rx-Tx measurement accuracy requirements shall apply if the uplink transmission timing changes during the UE Rx-Tx measurement period due to autonomous adjustment.****Proposal 3: UE Rx-Tx measurement accuracy requirements in the case of serving cell changes other than HO that do not impact the configuration of SRS for positioning are FFS.****Proposal 4: RAN4 will add a non-zero group delay calibration margin to the UE Rx-Tx accuracy requirements in FR1 and FR2.****Observation 1: The group delay calibration margin should scale inversely with PRS bandwidth.****Proposal 5: For UE Rx-Tx measurements in FR1, add a group delay calibration margin of 4 ns \* (100/BW), where BW is the PRS bandwidth in MHz, to the accuracy requirements.****Proposal 6: Structure for UE Rx-Tx accuracy requirements. The frequency ranges for each SCS may be modified based on finalized simulation results.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Accuracy** **(Tc)** | **Es/Iot** **(dB)** | **PRS BW** **(PRB)** | **PRS SCS****(kHz)** | **Repetition factor**$(T\_{rep}^{PRS}\*L\_{PRS}/K\_{comb}^{PRS})$ |
| **[TBD]** | -3 | ≥ [24] | 15 | ≥ [4] |
| **[TBD]** | ≥ [52] | ≥ [1] |
| **[TBD]** | ≥ [104] | ≥ [1] |
| **[TBD]** | ≥ [268] | ≥ [1] |
| **[TBD]** | ≥ [48] | 30 | ≥ [1] |
| **[TBD]** | ≥ [132] | ≥ [1] |
| **[TBD]** | ≥ [272] | ≥ [1] |
| **[TBD]** | ≥ [24] | 60 | ≥ [4] |
| **[TBD]** | ≥ [64] | ≥ [1] |
| **[TBD]** | ≥ [132] | ≥ [1] |
| **[TBD]** | -13 | ≥ [24] | 15 | ≥ [4] |
| **[TBD]** | ≥ [52] | ≥ [1] |
| **[TBD]** | ≥ [104] | ≥ [1] |
| **[TBD]** | ≥ [268] | ≥ [1] |
| **[TBD]** | ≥ [48] | 30 | ≥ [1] |
| **[TBD]** | ≥ [132] | ≥ [1] |
| **[TBD]** | ≥ [272] | ≥ [1] |
| **[TBD]** | ≥ [24] | 60 | ≥ [4] |
| **[TBD]** | ≥ [64] | ≥ [1] |
| **[TBD]** | ≥ [132] | ≥ [1] |

Table 3: UE Rx-Tx accuracy in FR1**(continued)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Accuracy** **(Tc)** | **Es/Iot** **(dB)** | **PRS BW** **(PRB)** | **PRS SCS****(kHz)** | **Repetition factor**$(T\_{rep}^{PRS}\*L\_{PRS}/K\_{comb}^{PRS})$ |
| **[TBD]** | -3 | ≥ [24] | 60 | ≥ [4] |
| **[TBD]** | ≥ [64] | ≥ [1] |
| **[TBD]** | ≥ [132] | ≥ [1] |
| **[TBD]** | ≥ [24] | 120 | ≥ [4] |
| **[TBD]** | ≥ [32] | ≥ [1] |
| **[TBD]** | ≥ [64] | ≥ [1] |
| **[TBD]** | ≥ [128] | ≥ [1] |
| **[TBD]** | -13 | ≥ [24] | 60 | ≥ [4] |
| **[TBD]** | ≥ [64] | ≥ [1] |
| **[TBD]** | ≥ [132] | ≥ [1] |
| **[TBD]** | ≥ [24] | 120 | ≥ [4] |
| **[TBD]** | ≥ [32] | ≥ [4] |
| **[TBD]** | ≥ [64] | ≥ [1] |
| **[TBD]** | ≥ [128] | ≥ [1] |

Table 4: UE Rx-Tx accuracy in FR2 |
| [**R4-2109942**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2109942.zip) | vivo | **Proposal 1: UE Rx-Tx time difference accuracy requirements shall not apply if NTA\_offset defined in Table 7.1.2-2 in 38.133 changes during the UE Rx-Tx measurement period****Proposal 2: UE Rx-Tx measurement accuracy requirements shall not apply if the uplink transmission timing changes during the UE Rx-Tx measurement period due to network-configured TA command.** **Proposal 3: UE Rx-Tx measurement accuracy requirements shall apply if the uplink transmission timing changes during the UE Rx-Tx measurement period due to autonomous adjustment****Proposal 4: For the serving cell change not impacting SRS configuration, the UE shall continue the on-going UE Rx-Tx time difference measurement and the current measurement accuracy requirements apply.****Proposal 5: UE Rx-Tx time difference measurement accuracy rquirements are specified as in Table 1a and Table 2a for FR1 and FR2 respectively.** |
| [**R4-2110053**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2110053.zip) | OPPO | **Proposal 1: For the applicability of accuracy requirements under TA adjustment, support option 2:*** **UE Rx-Tx measurement accuracy requirements shall not apply if the uplink transmission timing changes during the UE Rx-Tx measurement period due to network-configured TA command.**
* **UE Rx-Tx measurement accuracy requirements shall apply if the uplink transmission timing changes during the UE Rx-Tx measurement period due to autonomous adjustment**

**Proposal 2: For the applicability of accuracy requirements under NTA\_offset change, support option 1:** * **Clarify in section 10.1.25.2 in TS 38.133: “UE Rx-Tx time difference accuracy requirements shall not apply if NTA\_offset defined in Table 7.1.2-2 in 38.133 changes during the UE Rx-Tx measurement period.”**

**Proposal 3: For the applicability of accuracy requirements in case of other (non-HO) serving cell changes support option 1:** * **The UE shall continue and complete a UE Rx-Tx measurement while meeting UE Rx-Tx measurement accuracy requirements in clause 10.1.23, when a serving cell change (including SCell change, addition, release, activation, or deactivation, or PSCell change, addition, or release) occurs during the measurement, provided the cell change does not impact the configuration of the SRS used for the measurement.**

**Proposal 4: The number of “1” in *MutingPattern-r16* for *mutingOption2-r16* should be used to calculate PRS resource repetition factor for UE Rx-Tx time difference accuracy.****Proposal 5: Discuss whether and how to calculate PRS resource repetition factor for RSTD accuracy when partial PRS resource repetitions are within MG.** |
| [**R4-2110886**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2110886.zip) | Huawei, HiSilicon | **Proposal 1: Capture in the specification that UE Rx-Tx accuracy requirements do not apply in case the UE UL timing changes during the measurement period.****Proposal 2: Capture the following texts in 38.133:****“UE Rx-Tx accuracy requirements do not apply in case a serving cell change that impacts configuration of the positioning SRS occurs during the measurement.”****Proposal 3: RAN4 to consider the following tables for defining UE Rx-Tx accuracy requirements. Some BW ranges can be merged, if the accuracy numbers are similar when considering the margins.****Table 1: Template for UE Rx-Tx accuracy requirements FR1 with fading channel**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Accuracy (Tc)** | **Es/Iot (dB)** | **PRB num** | **SCS (kHz)** | **Repetition**  |
|  | -3 | ≥24 | 15 | ≥1 |
|  | ≥52 | ≥1 |
|  | ≥104 | ≥1 |
|  | ≥48 | 30 | ≥1 |
|  | ≥[200] | ≥1 |
|  | ≥24 | 60 | ≥1 |
|  | ≥[200] | ≥1 |
|  | -13 | ≥24 | 15 | ≥4 |
|  | ≥52 | ≥1 |
|  | ≥48 | 30 | ≥1 |
|  | ≥[200] | ≥1 |
|  | ≥64 | 60 | ≥1 |
|  | ≥132 | ≥1 |

**Table 2: Template for UE Rx-Tx accuracy requirements FR2 with fading channel**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Accuracy (Tc)** | **Es/Iot (dB)** | **PRB num** | **SCS (kHz)** | **Repetition**  |
|  | -3 | ≥24 | 60 | ≥1 |
|  | ≥24 | 120 | ≥1 |
|  | -13 | ≥64 | 60 | ≥1 |
|  | ≥24 | 120 | ≥1 |

**Table 3: Template for UE Rx-Tx accuracy requirements FR1 with AWGN channel**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Accuracy (Tc)** | **Es/Iot (dB)** | **PRB num** | **SCS (kHz)** | **Repetition**  |
|  | -3 | ≥24 | 15 | ≥1 |
|  | ≥52 | ≥1 |
|  | ≥104 | ≥1 |
|  | ≥[200] | ≥1 |
|  | ≥48 | 30 | ≥1 |
|  | ≥132 | ≥1 |
|  | ≥[200] | ≥1 |
|  | ≥24 | 60 | ≥1 |
|  | ≥64 | ≥1 |
|  | ≥132 | ≥1 |
|  | -13 | ≥24 | 15 | ≥1 |
|  | ≥52 | ≥1 |
|  | ≥104 | ≥1 |
|  | ≥[200] | ≥1 |
|  | ≥48 | 30 | ≥1 |
|  | ≥132 | ≥1 |
|  | ≥[200] | ≥1 |
|  | ≥24 | 60 | ≥1 |
|  | ≥64 | ≥1 |
|  | ≥132 | ≥1 |

**Table 4: Template for UE Rx-Tx accuracy requirements FR2 with AWGN channel**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Accuracy (Tc)** | **Es/Iot (dB)** | **PRB num** | **SCS (kHz)** | **Repetition**  |
|  | -3 | ≥24 | 60 | ≥1 |
|  | ≥64 | ≥1 |
|  | ≥132 | ≥1 |
|  | ≥24 | 120 | ≥1 |
|  | ≥64 | ≥1 |
|  | ≥128 | ≥1 |
|  | -13 | ≥24 | 60 | ≥1 |
|  | ≥64 | ≥1 |
|  | ≥132 | ≥1 |
|  | ≥24 | 120 | ≥1 |
|  | ≥64 | ≥1 |
|  | ≥128 | ≥1 |

**Proposal 4: RAN4 to further discuss the calibration margin for UE Rx-Tx, e.g. how to account for the Tx path calibration error.** |
| [**R4-2111344**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2111344.zip) | Ericsson | **CR** |

## Open issues summary and companies’ views collection for 1st round

### Sub-topic 4-1 Applicability of accuracy requirements in the case of NTA\_offset change

* Option 1(Qualcomm, Intel, vivo, OPPO, Huawei):
	+ Clarify in section 10.1.25.2 in TS 38.133: “UE Rx-Tx time difference accuracy requirements shall not apply if NTA\_offset defined in Table 7.1.2-2 in 38.133 changes during the UE Rx-Tx measurement period.”
* Option 2 (CATT):
	+ Capture in the specification that UE Rx-Tx accuracy requirements do not apply in case the UE UL timing changes during the measurement period

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

|  |  |
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| **Company** | **Comments** |
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### Sub-topic 4-2 Applicability of accuracy requirements under TA adjustment

* Option 1. ( )
	+ UE Rx-Tx measurement accuracy requirements shall not apply if the uplink transmission timing changes during the UE Rx-Tx measurement period due to autonomous adjustment or based on network-configured TA
* Option 2. (Qualcomm, vivo, OPPO, Ericsson)
	+ UE Rx-Tx measurement accuracy requirements shall not apply if the uplink transmission timing changes during the UE Rx-Tx measurement period due to network-configured TA command.
	+ UE Rx-Tx measurement accuracy requirements shall apply if the uplink transmission timing changes during the UE Rx-Tx measurement period due to autonomous adjustment
* Option 3. (CATT):
	+ Capture in the specification that UE Rx-Tx accuracy requirements do not apply in case the UE UL timing changes during the measurement period

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

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| --- | --- |
| **Company** | **Comments** |
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### Sub-topic 4-3 Applicable accuracy requirement in case of other (non-HO) serving cell changes

Candidate options

* Option 1 (vivo, OPPO, Huawei, Ericsson): The UE shall continue and complete a UE Rx-Tx measurement while meeting UE Rx-Tx measurement accuracy requirements in clause 10.1.23, when a non-HO serving cell change occurs during the measurement, provided the cell change does not impact the configuration of the SRS used for the measurement.
* Option 2(CATT): Accuracy requirements apply with serving cell change, provided that the serving cell change does not impact the UL timing. No need to capture this in the spec.
* Option 3 (Qualcomm): FFS

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

|  |  |
| --- | --- |
| **Company** | **Comments** |
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### Sub-topic 4-4 Group delay calibration margin

* Option 1 (Huawei).: RAN4 to further discuss the calibration margin for UE Rx-Tx, e.g. how to account for the Tx path calibration error.
* Option 2(Qualcomm). For UE Rx-Tx measurements in FR1, add a group delay calibration margin of 4 ns \* (100/BW), where BW is the PRS bandwidth in MHz, to the accuracy requirements

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

|  |  |
| --- | --- |
| **Company** | **Comments** |
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|  |  |
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### Sub-topic 4-5 UE Rx-Tx time difference measurement accuracy requirements

#### Sub-topic 4-7-1 Whether the separated requirements needed for each SCS

* Option 1(Intel): The requirements can be defined based on the agreed tables in the last meeting with the aligned simulation results
* Option 2(Qualcomm, vivo): Modify the agreed tables in the last meeting to define the separated requirements for each SCS

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

|  |  |
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| **Company** | **Comments** |
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#### Sub-topic 4-7-2 New PRS BW ranges for the requirements of fading channel

* Option 1(Huawei):
* For AWGN channel, the BW ranges are same as RSTD in [2]
* For fading channel, some BW ranges are removed e.g. large BW for FR2 at -3dB because the performance are rather similar for all BWs
* Option 2(Intel)
	+ Not changed in comparison with the agreed table in the last meeting.

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

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| **Company** | **Comments** |
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#### Sub-topic 4-7-3 Repetition factor

* Option 1(OPPO):
	+ The number of “1” in MutingPattern-r16 for mutingOption2-r16 should be used to calculate PRS resource repetition factor for UE Rx-Tx time difference accuracy.
	+ Discuss whether and how to calculate PRS resource repetition factor for RSTD accuracy when partial PRS resource repetitions are within MG.

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

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| **Company** | **Comments** |
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### CRs/TPs

|  |  |
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| **CR/TP number** | **Comments collection** |
| [**R4-2111344**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2111344.zip) **(Ericsson)** |  |
|  |
|  |  |
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## Summary for 1st round (TBD)

### Open issues

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Sub-topic#4-1** | **Applicability of accuracy requirements in the case of NTA\_offset change***Tentative agreements: None**Candidate options:**Recommendations for 2nd round: Can be FFS* |
| **Sub-topic#4-2** | **Applicability of accuracy requirements in the case of in the case of TA adjustment***Tentative agreements:* *Candidate options:**Recommendations for 2nd round: Can be FFS* |
| **Sub-topic#4-3** | **Applicable accuracy requirement in case of other (non-HO) serving cell changes***Tentative agreements:* *Candidate options:**Recommendations for 2nd round: Can be FFS* |
| **Sub-topic#4-4** | **How to define the accuracy requirements with the combinations of PRS BW and other parameters** *Tentative agreements: Follow the same principle of RSTD accuracy.**Candidate options:**Recommendations for 2nd round:* continue discussion on alignment of simulation results |
| **Sub-topic#4-5** | **Applicable propagation channel for accuracy requirement***Tentative agreements: Follow the same principle of RSTD accuracy.**Candidate options:**Recommendations for 2nd round:*No further discussion |
| **Sub-topic#4-6** | **Group delay calibration margin***Tentative agreements:* * *Candidate options:*

*Recommendations for 2nd round:* |
| **Sub-topic#4-7** | **UE Rx-Tx time difference measurement accuracy requirements** *Tentative agreements:**Candidate options:**Recommendations for 2nd round:.*. |

### CRs/TPs

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
|  |  |
|  |  |
|  |  |

## Discussion on 2nd round

Please only comment on topics that are selected for discussion in 2nd round.

### Sub-topic 4-7 UE Rx-Tx time difference measurement accuracy requirements

## Summary on 2nd round

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc status update recommendation**  |
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|  |  |
|  |  |

# Topic #5: Test cases (AI6.5.2.2.3)

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2108765**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2108765.zip) | ZTE Corporation | draftCR |
| [**R4-2109097**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2109097.zip) | CATT | draftCR |
| [**R4-2109231**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2109231.zip) | Intel Corporation | ***Proposal 1: SRS configuration can be specified as Table 1.*** **Table 1: general SRS configuration for UE Rx-Tx RRM test cases**

|  |  |  |
| --- | --- | --- |
| SRS-Resource | SRS-ResourceId | 0 |
|  | nrofSRS-Ports | Port1 |
|  | transmissionComb  | n4 |
|  | combOffset-n4 | 0 |
|  | cyclicShift-n4 | 0 |
|  | resourceMappingstartPosition | 0 |
|  | resourceMappingnrofSymbols  | n4 |
|  | resourceMappingrepetitionFactor | n1 |
|  | freqDomainPosition | 0 |
|  | freqDomainShift | 0 |
|  | freqHoppingc-SRS | Matches NRB,c  |
|  | groupOrSequenceHopping | Neither |
|  | resourceType | Periodic |
|  | periodicityAndOffset-p | 80\*2^u, 20\*2^u |
|  | sequenceId | 0 |

***Proposal 2: Absolute measurement reporting is tested for all PRS measurements. It is unnecessary to define the test case for differential RSTD.******Proposal 3: The setup of AoA for RSTD testing in FR2 can be based on AoA setup 1 for all cells/TRPs.*** ***Proposal 4: The synchronous cells will be tested for the measurement delay requirements test.*** ***Proposal 5: For the core requirements test cases the following muting PRS configuration will be used.**** ***Cell 1: ‘11110000’***
* ***Cell 2: ‘00001111’***
* ***Cell 3: ‘11110000’***

***Proposal 6: Gap pattern #0 and #24 can be used for NR Positioning tests.*** ***Proposal 7: The test procedure for LTE OTDoA[4] can be reused for NR positioning measurement testing*** |
| [**R4-2109232**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2109232.zip) | Intel Corporation | draftCR |
| [**R4-2109233**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2109233.zip) | Intel Corporation | draftCR |
| [**R4-2109865**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2109865.zip) | Qualcomm Incorporated | **Proposal 1: For PRS-RSRP measurement accuracy testing, define test cases with two PRS resources per TRP (in the same DL-PRS Resource Set) and configure the UE to report two measurements per TRP so that differential reporting is used to report one of the measurements.****Proposal 2:*** **Clarify the number of PRBs in the reference PRS configurations for SCS = 15 kHz, 30 kHz and 120 kHz.**
* **Add a reference PRS configuration with 24 PRBs and SCS = 15 kHz.**
* **PRS comb size = 2 or 4.**
* **Number of PRS symbols = K\*comb\_size, K = 1, 4 (if needed).**

**Proposal 3: Match SRS periodicity to PRS periodicity, i.e. 160 ms.****Proposal 4: Support the proposed reference test configurations below under the assumption that they correspond to the Pcell configuration and do not constrain the PRS bandwidth and SCS to be tested in each test case.****Proposal 5: Incorporate type 1 PRS muting in some of the measurement period test cases. E.g. RSTD measurement period tests with 3 TRPs.****Proposal 6: Test synchronous cells/TRPs with small time offsets (e.g. 3 usec) between cells as in the simulation assumptions.** |
| [**R4-2110054**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2110054.zip) | OPPO | **Proposal 1: Support option 1a: Do not define RSTD accuracy tests with differential RSTD. No need to limit the reporting format for the test cases.****Proposal 2: Only synchronous cells should be defined for test cases.****Proposal 3: Muting PRS configuration should be defined for core requirements test cases.****Proposal 4: Non-muting PRS configuration should be defined for performance requirements test cases.****Proposal 5a: The test procedure for LTE OTDOA can be reused for NR RSTD measurement delay tests.** **Proposal 5b: Consider simplified test procedure for LTE OTDOA for other measurement delay tests and all accuracy tests.**  |
| [**R4-2110055**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2110055.zip) | OPPO | CR |
| [**R4-2110887**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2110887.zip) | Huawei, HiSilicon | **Proposal 1: The number of PRS resources per TRP is configured as*** **One, for RSTD and UE Rx-Tx tests**
* **Two, for PRS-RSRP tests**

**Proposal 2: Use comb-2 with symbol-8 for the PRS configuration with 4 repetitions.****Proposal 3: Consider Table 2 for general SRS configuration for UE Rx-Tx test cases.****Table 2: general SRS configuration for UE Rx-Tx RRM test cases**

|  |  |  |
| --- | --- | --- |
| SRS-Resource | SRS-ResourceId | 0 |
|  | nrofSRS-Ports | Port1 |
|  | transmissionComb  | n4 |
|  | combOffset-n4 | 0 |
|  | cyclicShift-n4 | 0 |
|  | resourceMappingstartPosition | 0 |
|  | resourceMappingnrofSymbols  | n4 |
|  | resourceMappingrepetitionFactor | n1 |
|  | freqDomainPosition | 0 |
|  | freqDomainShift | 0 |
|  | freqHoppingc-SRS | Matches NRB,c  |
|  | groupOrSequenceHopping | Neither |
|  | resourceType | Periodic |
|  | periodicityAndOffset-p | 160\*2^u, 20\*2^u |
|  | sequenceId | 0 |

**Proposal 4: Define test cases for sync scenarios only.****Proposal 5: Define test cases without muting.****Proposal 6: Re-use the test configurations {10MHz BW, 15kHz SCS}, {40MHz BW, 30kHz SCS} and {100MHz BW, 120kHz SCS} for serving cell.****Proposal 7: RAN4 to align whether single PFL and dual PFL are tested as sub-tests of the same test case, or with separate test cases.**  |
| [**R4-2110888**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2110888.zip) | Huawei, HiSilicon | draftCR |
| [**R4-2110889**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2110889.zip) | Huawei, HiSilicon | draftCR |
| [**R4-2110890**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2110890.zip) | Huawei, HiSilicon | draftCR |
| [**R4-2111345**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2111345.zip) | Ericsson | * ***Proposal 1****: In the test one cell is serving and other cell(s) as non-serving cell.*
* ***Proposal 2****: Absolute measurement reporting is tested for all positioning measurements (RSTD, PRS-RSRP and* UE Rx-Tx time difference).
* ***Proposal 3****: Differential measurement reporting is tested for one positioning measurement (preferably UE Rx-Tx time difference).*
* ***Proposal 4****: All cells are synchronous in all positioning test cases regardless of whether the cells belong to FDD band or TDD band.*
* ***Proposal 5****: The maximum radio frame receive time offset between any pair of the cells at the UE antenna connector shall be within 3 µs.*
* ***Proposal 6****: Same measurement gap configuration is used in all positioning test cases.*
* ***Proposal 7****: Use gap configuration # 24 in all positioning test cases.*
* ***Proposal 8****: In each accuracy test case, the NR measurements are tested for multiple PRS measurement bandwidths, with at least:*
	+ *the smallest bandwidth,*
	+ *a bandwidth from the medium bandwidths range (e.g., >48 PRBs in FR1 or >32 PRBs in FR2),*
	+ *a bandwidth from the large bandwidths range (e.g., >132 PRBs in FR1 or >64 PRBs in FR2).*
* ***Proposal 9****: No PRS repetitions are configured in NR positioning test cases for PRS BW which does not need repetition in the requirements.*
* ***Proposal 10****: Number of PRS repetitions in NR positioning test cases for smallest PRS BW shall nor be larger than the one for which the requirements apply.*
* ***Proposal 11****: PRS SCS is the same as SSB SCS.*
* ***Proposal 12****: Configure DRX in all NR positioning test cases.*
* ***Proposal 13****: Supported test configurations for FR1:*

|  |  |
| --- | --- |
| *Configuration* | *Description* |
| *1* | *15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode* |
| *2* | *15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode* |
| *3* | *30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode* |
| *NOTE: The UE is only required to be tested in one of the supported test configurations.* |

* ***Proposal 14****: Supported test configurations for FR2:*

|  |  |
| --- | --- |
| *Configuration* | *Description* |
| *1* | *120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode* |

* ***Proposal 15****: SRS configuration in UE Rx-Tx test cases is based on the following assumptions:*
	+ *frequency hopping: no*
	+ *group or sequence hopping: no*
	+ *Number of antenna ports: 1*
	+ *Resource type: periodic*
	+ *SCS: same as for SSB.*
 |
| [**R4-2111346**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2111346.zip) | Ericsson | draftCR |
| [**R4-2111347**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2111347.zip) | Ericsson | draftCR |

## Open issues summary and companies’ views collection for 1st round

### Sub-topic 5-1 Channel conditions defined in the test cases

[*Moderator notes: this open issue is to address the issues below.*

* + - *Test cases for accuracy requirements are defined for*
			* *AWGN conditions*
			* *FFS: fading conditions for FR1*

]

* Option 1 (CATT, OPPO)
	+ Defined for AWGN condition only.
* Option 2(vivo)
	+ Tests to verify RSTD and UE Rx-Tx accuracy requirements under fading channel can be considered if feasibility is possible in terms of TE complexity

Recommended WF: *Could the following proposal be agreeable?*

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| **Company** | **Comments** |
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### Sub-topic 5-2 Absolute measurement reporting in test cases

* Option 1 (Ericsson):
	+ Absolute measurement reporting is tested for all positioning measurements (RSTD, PRS-RSRP and UE Rx-Tx time difference).
	+ Differential measurement reporting is tested for one positioning measurement (preferably UE Rx-Tx time difference).
* Option 2a(Huawei, OPPO): Do not define RSTD accuracy tests with differential RSTD. No need to limit the reporting format for the test cases.
	+ For RSTD and UE Rx-Tx tests, we only have absolute accuracy requirements and one PRS resource per TRP shall be configured
* Option 2b( Qualcomm, Huawei): For PRS-RSRP measurement accuracy testing, define test cases with two PRS resources per TRP (in the same DL-PRS Resource Set) and configure the UE to report two measurements per TRP so that differential reporting is used to report one of the measurements

Recommended WF:

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| **Company** | **Comments** |
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### Sub-topic 5-3 Test case list clarifications

* Option 1 (Ericsson)
	+ In the test one cell is serving and other cell(s) as non-serving cell.

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

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| **Company** | **Comments** |
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### Sub-topic 5-4 General PRS configuration for NR Positioning test cases

#### Sub-topic 5-4-1 Comb size, number of symbol , slot repetition factor

*[Moderator notes: In the last meeting a CR for the general PRS configuration used was endorsed. In this meeting, some proposals on the revised parameters can be FFS below.]*

* Option 1 (Qualcomm)
	+ Add a reference PRS configuration with 24 PRBs and SCS = 15 kHz.
	+ PRS comb size = 2 or 4.
	+ Number of PRS symbols = K\*comb\_size, K = 1, 4 (if needed).
* Option 2 (Huawei)
	+ Use comb-2 with symbol-8 for the PRS configuration with 4 repetitions.

[Moderator notes: number of PRS symbol = {2, 4, 6, 12} only.]

* Option 3(Ericsson)
	+ No PRS repetitions are configured in NR positioning test cases for PRS BW which does not need repetition in the requirements.
	+ Number of PRS repetitions in NR positioning test cases for smallest PRS BW shall nor be larger than the one for which the requirements apply.

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

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| **Company** | **Comments** |
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### Sub-topic 5-3 SRS configuration for NR Positioning test case

* Option 1 (Intel, Huawei)
	+ BW: to define the SRS BW corresponding to the channel BW, i.e. 10MHz for 15kHz SCS, 40MHz for 30kHz SCS and 100MHz for 120kHz SCS.
	+ comb size 4 with 4 OFDM symbols.
	+ 80ms, and the offset is 20ms (the separation between PRS and SRS is 10ms).
* **Table 2: general SRS configuration for UE Rx-Tx RRM test cases**

|  |  |  |
| --- | --- | --- |
| SRS-Resource | SRS-ResourceId | 0 |
|  | nrofSRS-Ports | Port1 |
|  | transmissionComb  | n4 |
|  | combOffset-n4 | 0 |
|  | cyclicShift-n4 | 0 |
|  | resourceMappingstartPosition | 0 |
|  | resourceMappingnrofSymbols  | n4 |
|  | resourceMappingrepetitionFactor | n1 |
|  | freqDomainPosition | 0 |
|  | freqDomainShift | 0 |
|  | freqHoppingc-SRS | Matches NRB,c  |
|  | groupOrSequenceHopping | Neither |
|  | resourceType | Periodic |
|  | periodicityAndOffset-p | 160\*2^u, 20\*2^u |
|  | sequenceId | 0 |

* Option 2(Ericsson)
	+ *frequency hopping: no*
	+ *group or sequence hopping: no*
	+ *Number of antenna ports: 1*
	+ *Resource type: periodic*
	+ *SCS: same as for SSB*
* Option 3 (Qualcomm) Match SRS periodicity to PRS periodicity, i.e. 160 ms

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

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| **Company** | **Comments** |
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### Sub-topic 5-6 Number of positioning frequency layers

* Option 1 (Huawei)
	+ **RAN4 to align whether single PFL and dual PFL are tested as sub-tests of the same test case, or with separate test cases**

[*Moderator notes: in the last meeting the following agreements were achieved*.

* + *Test Case 1 or Case 2 for delay tests and RSTD accuracy tests. Test Case 1 for PRS-RSRP and UE Rx-Tx accuracy tests*
		- *Case 1: 1 PFL, and all cells are on the same PFL*
		- *Case 2: 2 PLFs, and cells are distributed on two PFLs*
	+ *UE supporting more than one PFL only needs to pass tests for Cas*e 2.

*So, please companies provide your view on the question from Huawei above]*

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

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| **Company** | **Comments** |
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### Sub-topic 5-7 Synchronous/Asynchronous cells

* Option 1. (Intel, Huawei, OPPO, Ericsson): The synchronous cells will be tested for the measurement delay requirements test.

Recommended WF: Option 1 can be agreeable.

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| **Company** | **Comments** |
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### Sub-topic 5-8 Muting pattern

* Option 1 (OPPO)
	+ PRS configuration should be defined for core requirements test cases.
	+ Non-muting PRS configuration should be defined for performance requirements test cases.
* Option 1a (Qualcomm): type 1 PRS muting for RSTD measurement period report testing cases
* Option 1a. (Intel):
* For the core requirements test cases the following muting PRS configuration will be used.
	+ ***Cell 1: ‘11110000’***
	+ ***Cell 2: ‘00001111’***
	+ ***Cell 3: ‘11110000’***
* Option 2 (Huawei): No

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

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| **Company** | **Comments** |
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### Sub-topic 5-9 Reporting configuration

* Option 1 (Ericsson): The network configured k is set as follows:
	+ timingReportingGranularityFactor=0 for FR1,
	+ timingReportingGranularityFactor=2 for FR2

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

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| **Company** | **Comments** |
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### Sub-topic 5-10 Supported test configurations in FR1

* Option 1 (Ericsson, Huawei): *Supported test configurations for FR1:*

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. |

* Option 1a (Qualcomm): Support the proposed reference test configurations below under the assumption that they correspond to the Pcell configuration and do not constrain the PRS bandwidth and SCS to be tested in each test case.

*Supported test configurations for FR1:*

|  |  |
| --- | --- |
| *Configuration* | *Description* |
| *1* | *15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode* |
| *2* | *15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode* |
| *3* | *30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode* |
| *NOTE: The UE is only required to be tested in one of the supported test configurations.* |

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

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| **Company** | **Comments** |
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### Sub-topic 5-15 Supported test configurations in FR2

* Option 1 (Ericsson, Huawei): *Supported test configurations for FR2:*

|  |  |
| --- | --- |
| *Configuration* | *Description* |
| *1* | *120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode* |

* Option 1a (Qualcomm): : Support the proposed reference test configurations below under the assumption that they correspond to the Pcell configuration and do not constrain the PRS bandwidth and SCS to be tested in each test case.

*Supported test configurations for FR2:*

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

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

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| **Company** | **Comments** |
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### Sub-topic 5-12 Gap pattern

* Option 1 (Intel): #0 and #24
* Option 2(Ericsson): #24 and *Same measurement gap configuration is used in all positioning test cases*
* Recommended WF: Option 2 can be agreed for simplicity.

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| **Company** | **Comments** |
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### Sub-topic 5-13 Testing procedure

* Option 1 (Intel, OPPO)
	+ The test procedure for LTE OTDOA can be reused for NR RSTD measurement delay tests.
* Option 1a (OPPO)
	+ Consider simplified test procedure for LTE OTDOA for other measurement delay tests and all accuracy tests**.**
* Recommended WF: The testing procedure for LTE OTDoA can be reused for NR RSTD and UE Rx-Tx time difference measurement tests.

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| **Company** | **Comments** |
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### Sub-topic 5-14 OTA testing parameters

* Option 1 (Intel): The setup of AoA for RSTD testing in FR2 can be based on AoA setup 1 for all cells/TRPs.

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

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| **Company** | **Comments** |
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### CRs/TPs

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| **CR/TP number** | **Comments collection** |
| [**R4-2108765**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2108765.zip) [draft CR] Test cases for PRS-RSRP measurement accuracy (ZTE) |  |
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| [**R4-2109097**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2109097.zip)CR on test case for PRS-RSRP measurement requirements for FR2 in SA (CATT) |  |
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| [**R4-2109232**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2109232.zip) draftCR] CR for PRS configurations for NR Pos RRM tests (Intel) |  |
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| [**R4-2109233**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2109233.zip) draftCR] CR for the test case of RSTD measurement requirements reporting in SA (Intel) |  |
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| [**R4-2111346**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2111346.zip)TC5 and TC6: UE Rx-Tx time difference measurement requirements for FR1 and FR2 in SA (Ericsson) |  |
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| [**R4-2111347**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2111347.zip) TC11 and TC12: UE Rx-Tx time difference measurement accuracy for FR1 and FR2 in SA (Ericsson) |  |
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| [**R4-2110888**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2110888.zip)draftCR to introduce TC for PRS-RSRP measurement requirements for FR1 in SA**(Huawei)** |  |
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| [**R4-2110889**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2110889.zip)draftCR to introduce TC for RSTD measurement accuracy for FR1 and FR2 in SA (Huawei) |  |
| [**R4-2110890**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2110890.zip)(Huawei) |  |
| [**R4-2110055**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2110055.zip)**OPPO** |  |
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## Summary for 1st round (TBD)

### Open issues

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|  | **Status summary**  |
| **Sub-topic#5-1** | *Tentative agreements:**Candidate options:**Recommendations for 2nd round: Please companies check whether the tentative agreements is agreeable.* |
| **Sub-topic#5-2** | **Test cases for** serving carrier frequencies and non-serving carrier frequencies **measurements***Tentative agreements:* *Candidate options:**Recommendations for 2nd round : No further discussion needed.* |
| **Sub-topic #5-3** | **Absolute measurement reporting in test cases***Tentative agreements: None**Candidate options:**Recommendations for 2nd round: Can be FFS* |
| **Sub-topic#5-4** | **Test case list clarifications** *Tentative agreements:**Candidate options:**Recommendations for 2nd round: Can be FFS up to* issue 5-9 |
| **Sub-topic#5-5** | *Tentative agreements:* *Candidate options:**Recommendations for 2nd round:*  |
| **Sub-topic#5-6-1** | **General PRS configuration for NR Positioning test case***Tentative agreements**Candidate options**Recommendations for 2nd round:* |
| **Sub-topic#5-6-2** | **Combination of Comb size, number of symbol , slot repetition factor***Tentative agreements: None.**Candidate options**Recommendations for 2nd round: Can be FFS up to accuracy requirements*  |
| **Sub-topic#5-6-3** | **PRS BW***Tentative agreements:* *Candidate options**Recommendations for 2nd round: Can be FFS.*  |
| **Sub-topic#5-7** |  |
| **Sub-topic#5-8** | **Number of cells/TRPs for NR Positioning test case***Tentative agreements: According to TE vendor’s comments on the testing complexity, could we agree the following option:* * two TRPs in the test case

*Candidate options:**Recommendations for 2nd round: Please companies check the tentative agreements is agreeable.**Can be FFS* |
| **Sub-topic#5-9** | **Number of positioning frequency layers***Tentative agreements** + Test Case 1 or Case 2 for delay tests and RSTD accuracy tests. Test Case 1 for PRS-RSRP and UE Rx-Tx accuracy tests
		- Case 1: 1 PFL, and all cells are on the same PFL
		- Case 2: 2 PLFs, and cells are distributed on two PFLs
		- UE supporting more than one PFL only needs to pass tests for Case 2.

*Candidate options:**Recommendations for 2nd round : Please companies check the tentative agreements is agreeable* |
| **Sub-topic#5-10** | **Synchronous/Asynchronous cells***Tentative agreements: None**Candidate options:** Option 1. (Intel, Huawei): The synchronous cells will be tested for the measurement delay requirements test.
* Option 1a(Qualcomm): Time synchronicity constraints between cells/TRPs may be incorporated in the test configurations to the extent needed to ensure that the Es/Iot side conditions are met during testing

*Recommendations for 2nd round: Can be FFS* |
| **Sub-topic#5-11** | **Muting pattern** *Tentative agreements: None**Candidate options:**Recommendations for 2nd round: Can be FFS* |
| **Sub-topic#5-12** | **Subsets of accuracy tests***Tentative agreements:* *Candidate options:**Recommendations for 2nd round: Please companies check the tentative agreements are agreeable.* |
| **Sub-topic#5-13** | **Reporting configuration***Tentative agreements: None**Candidate options:**Recommendations for 2nd round: Can be FFS* |
| **Sub-topic #5-14** | *Tentative agreements: None**Candidate options:**Recommendations for 2nd round: Can be FFS* |
| **Sub-topic #5-15** | **Supported test configurations in FR2***Tentative agreements: None.**Recommendations for 2nd round: Can be FFS.* |

### CRs/TPs

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| **CR/TP number** | **CRs/TPs Status update recommendation**  |
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## Discussion on 2nd round

Please only comment on topics that are selected for discussion in 2nd round.

### Sub-topic#5-1

### CRs/TPs

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| **CR/TP number** | **CRs/TPs Status update recommendation**  |
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## Summary on 2nd round

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| **CR/TP/LS/WF number** | **T-doc status update recommendation**  |
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# Simulation results

## Companies’ contributions summary

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| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2111342**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2111342.zip)  | Ericsson | On Methodology for estimating UE positioning measurement results |
| [R4-2109238](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_99-e/Docs/R4-2109238.zip) | Intel Corporation | Summary of link level simulation result for RSTD, PRS RSRP and UE Rx-Tx time difference |
| [**R4-2110882**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2110882.zip) | Huawei, HiSilicon | Additional simulation results for PRS measurement performance |
| [**R4-2111343**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2111343.zip) | Ericsson | Link level simulation results for RSTD, PRS RSRP and UE Rx-Tx time difference |
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| [**R4-2109866**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2109866.zip) | Qualcomm Incorporated | NR Pos performance simulation results |
| [**R4-2109943**](file:///C%3A%5CUsers%5Crhuang5%5COneDrive%20-%20Intel%20Corporation%5CDocuments%5Cmy_work%5CLTE_A%5CRAN4%5C99e%5CDocs%5CR4-2109943.zip) | vivo | link level simulation result of RSTD, PRS RSRP and UE Rx-Tx time difference |
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## Open issues summary

[*Moderator notes: all simulation results from the different companies were be included in* [*R4-2106457*](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_99-e/Docs/R4-2106457.zip) *for information only*.]

### Sub-topic 6-1 Which method used for the reference point of ideal TX time

*Please companies provide some clarifications on the method to model the ideal TX time using in the simulations in [R4-21105857]*

* Option 1. The absolute Tx time
* Option 2. The Tx time in the channel sampling point

Recommended WF: *Could the Option 1 be agreeable?*

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| **Company** | **Comments** |
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### Sub-topic 6-2 The methodology to conduct the accuracy requirements for RSTD/UE Rx-Tx time difference

* Option 1:
	+ Do not account misalignment of TO and UE sampling grid in the simulation results
	+ And add the channel quantization error margin (TBD, e.g. [Ts/2]) into the baseline requirement based on the simulation results above
* Option 2:
	+ Explicitly account misalignment of TO and UE sampling grid in the simulation results
	+ Derive the requirements directly from the simulation results above

Recommended WF: *Could the Option 2 be agreeable?*

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| **Company** | **Comments** |
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### Sub-topic 6-3 Simulation results collection (For information only)

# Recommendation for Tdocs (TBD)