**3GPP TSG-RAN WG4 Meeting # 111 R4-2408009**

**Fukuoka, JP, 20 ‒ 24 May 2024**

**Agenda item:** 7.12.3

**Source:** Moderator (Ericsson)

**Title:** Topic summary for [111][212] NR\_pos\_enh2\_part1

**Document for:** Information

# Introduction

This document contains discussion related to the following 5 topics:

* **Topic #1:** 7.12.1.1 General aspects (relevant tDocs for RRM core requirement maintenance)
* **Topic #2:** 7.12.1.4 Core maintenance: RedCap Positioning and PRS/SRS bandwidth aggregation
* **Topic #3:** 7.12.2.1 General aspects (relevant tDocs for RRM performance requirement)
* **Topic #4:** 7.12.2.4 Performance requirement: RedCap positioning
* **Topic #5:** 7.12.2.5 Performance requirement: PRS/SRS bandwidth aggregation

Recommended issues related to **core requirements** for the online discussion in the order of decreasing priority.

* **Core maintenance: RedCap positioning**
	+ Issue 2-1-1-4: Update to RAN4 UE feature list.
	+ Issue 2-1-1-2: Time window for RX FH in RRC\_INACTIVE/IDLE state.
	+ Issue 2-1-1-3: Mapping between PRS configuration and number of hops per slot in core requirements
	+ Issue 2-1-1-1: Clarification of parameters for number of RX FH within MG in RRC\_CONNECTED state
* **Core maintenance: PRS/SRS bandwidth aggregation**
	+ Issue 2-1-2-2: Interruption delay requirement for SRS aggregation.
	+ Issue 2-1-2-3: Core requirement for PRS-RSRP/RSRPP measurement based on bandwidth aggregation
	+ Issue 2-1-2-1: Clarification regarding nominal channel spacing in core requirements for PRS aggregation

Recommended issues related to **performance requirements** for the online discussion in the order of decreasing priority.

* **General aspects (RRM performance requirement)**
	+ Issue 3-1-1: Updated work split on test cases for RedCap positioning.
	+ Issue 3-1-2: Test cases for RRC\_IDLE mode
	+ Issue 3-1-4: Testing principles for positioning TCs in RRC\_IDLE mode
* **Performance requirement: RedCap positioning**
	+ Issue 4-1-1-1: Bandwidth configuration for accuracy requirement for positioning measurement with RX FH for RedCap positioning.
	+ Issue 4-1-2-2: PRS bandwidth for FH TCs for RedCap positioning.
	+ Issue 4-1-2-1: PRS RMC for RedCap positioning TCs
	+ Issue 4-1-1-3: Accuracy requirement for RedCap positioning.
* **Performance requirement: PRS/SRS bandwidth aggregation**
	+ Issue 5-1-1-1: Bandwidth configuration for PRS aggregation based measurement accuracy requirement.
	+ Issue 5-1-1-2: Accuracy requirement for PRS-RSRP/RSRPP measurement based on PRS aggregation.
	+ Issue 5-1-1-4: Accuracy requirement based on baseband sampling rate for measurements based on PRS aggregation.
	+ Issue 5-1-1-5: Accuracy requirements for 2 PFL and 3 PFL cases.
	+ Issue 5-1-1-8: Applicability of requirements for PRS aggregation.
	+ Issue 5-1-2-1: PRS resource set up for measurement delay test cases.

# Topic 1: General aspects for core maintenance (AI 7.12.1.1)

## DraftCRs

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Title** |
| [**R4-2409368**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409368.zip) | **Ericsson** | **Draft Big CR to 38.133 on RRM core requirements for Positioning Enhancements** |

# Topic 2: RRM core requirement maintenance for RedCap positioning and PRS/SRS bandwidth aggregation (AI 7.12.1.4)

## Contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2407491**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407491.zip) | **CATT** | **Proposal 1: RAN4 do not need to define interruption requirements for SRS transmission for BW aggregation on CC without PUSCH/PUCCH.** **Proposal 2: The clarification regarding the nominal channel spacing can be captured in performance part to make this feature clearer in specification.** |
| [**R4-2407878**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407878.zip) | **OPPO** | **Proposal 1: Clarify that** $N\_{rep}^{PRS} $**is the number of unmuted PRS repetitions (i.e. bit 1 signalled by dl-PRS-MutingOption2) within the MG occasion excluding the gap retuning times.****Proposal 2: If** $N\_{hops}^{slot}$ **= 1/2 and** $M\_{rep}^{PRS}$ **= 1, the effective number of Rx hops within a MG instance is defined as the number of PRS repetitions within MG occasion after applying the logic AND operation between bitmap-MutingOption2 and bitmap-default, where:*** **bitmap-MutingOption2 is the bitmap given by higher-layer parameter dl-PRS-MutingOption2.**
* **bitmap-default is “101010…” with the same length as bitmap-MutingOption2.**

**Proposal 3: 2 separate time windows defined in Rel-17 could be reused for redcap positioning with FH.****Proposal 4: The formula** $N\_{hop}=min\left(N\_{hops,effect},N\_{hop,max}\right)$ **should apply for each individual time window if PRS resources are separated into 2 windows.** **Proposal 5: Core requirement for timing measurements (RSTD or UE Rx-Tx) based on aggregated carriers/PFLs apply to PRS-RSRP/RSRPP, when UE reports PRS-RSRP/RSRPP together with the timing measurements (RSTD or UE Rx-Tx) based on the aggregated carriers/PFLs.****Proposal 6: Requirements for aggregate measurement are applicable to PRS resources in the resource sets that are indicated to be linked, provided that the alignment conditions defined by RAN1 are met.** |
| [**R4-2409266**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409266.zip) | **Huawei, HiSilicon** | **Proposal 1: Confirm Table 1 for mapping between PRS configuration and number of hops per slot.****Table 1: mapping between PRS configuration and number of hops per slot, version 1**

|  |  |  |  |
| --- | --- | --- | --- |
| $$RRT\_{FH}$$ | **(comb size, Number of PRS symbols)** | **Applicable number of hops per slot** $\left(N\_{hops}^{slot}\right)$ | **Applicable length per hop (**$T\_{hop}$**) in number of symbols** |
| $$RRT\_{FH}\leq 2 symbols$$ | **[(≤ 2, 12) with SCS 15kHz, 30kHz, 60kHz in FR2, 120kHz]** | **2** | **7** |
| **All others** | **1** | **14** |
| $$2 symbols <RRT\_{FH}\leq 6 symbols$$ | **(≤ 6, any)** | **1** | **14** |
| **(12, 12)** | **½** | **28** |
| $$RRT\_{FH}>6 symbols$$ | **Any combination** | **½** | **28** |

**Proposal 2: For aggregated measurements, when PRS-RSRP(P) is requested with TOA measurement, TOA and PRS-RSRP(P) measurements are performed over the same measurement period.****Proposal 3: RAN4 to define interruption requirements for SRS CA based on existing requirements for SRS carrier switching and SRS antenna switching.** |
| [**R4-2409583**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409583.zip) | **Ericsson** | 1. No update to time window for PRS measurement is needed for RedCap positioning, including Rx FH, in RRC\_INACTIVE/IDLE state.
2. Pre-requisite groups for RAN4 FGs 37-1 is updated to “RAN1 feature 28-1 or 48-1, 27-3-1, 41-5-1”.
3. Pre-requisite groups for RAN4 FG 37-1A is updated to “ RAN1 feature 28-1 or 48-1, 27-3-1, 41-5-1”.
4. For UEs supporting guard period values {30µs, 100µs, 140µs, 200µs} interruption lengths are defined by reusing the values in 8.2.2.2.9 of TS 38.133 for SRS aggregation.
 |
| [**R4-2409651**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409651.zip) | **Nokia** | **Proposal 1: RAN4 to discuss whether the time window length up to 10 ms is appropriate for RedCap positioning.** |
| [**R4-2409689**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409689.zip) | **ZTECorporation,Sanechips** | **Proposal 1:** * **The number of Rx hops measured by the RedCap UE in Inactive/Idle mode is given by**
	+ $N\_{hops}=min\left(N\_{hops,effect}, N\_{hops, max}\right)$

**where*** + - $N\_{hops, max}$ **is the maximum number of Rx hops signaled in the UE capability (FG 41-5-1a for INACTIVE state and FG 41-5-1b for IDLE state).**
		- $N\_{hops, effect}$ **is the effective number of Rx hops within a time window.**
 |

### Sub-Topic: RRM core requirement maintenance for RedCap positioning

**Issue 2-1-1-1: Clarification of parameters for number of RX FH within MG in RRC\_CONNECTED state.**

* Proposals
	+ Option 1: OPPO
		- Clarify that $N\_{rep}^{PRS} $is the number of unmuted PRS repetitions (i.e. bit 1 signalled by *dl-PRS-MutingOption2*) within the MG occasion excluding the gap retuning times.
		- If $N\_{hops}^{slot}$ = 1/2 and $M\_{rep}^{PRS}$ = 1, the effective number of Rx hops within a MG instance is defined as the number of PRS repetitions within MG occasion after applying the logic AND operation between *bitmap-MutingOption2* and *bitmap-default*, where:
			* *bitmap-MutingOption2* is the bitmap given by higher-layer parameter *dl-PRS-MutingOption2*.
			* bitmap-default is “101010…” with the same length as *bitmap-MutingOption2.*
* Recommended WF
	+ Discuss the option(s).

**Issue 2-1-1-2: Time window for RX FH in RRC\_INACTIVE/IDLE state.**

* Proposals
	+ Option 1: OPPO
		- 2 separate time windows defined in Rel-17 could be reused for redcap positioning with FH.
		- The formula $N\_{hop}=min\left(N\_{hops,effect},N\_{hop,max}\right)$ should apply for each individual time window if PRS resources are separated into 2 windows.
	+ Option 2: E///
		- No update to time window for PRS measurement is needed for RedCap positioning, including Rx FH, in RRC\_INACTIVE/IDLE state.
	+ Option 3: Nokia
		- RAN4 to discuss whether the time window length up to 10 ms is appropriate for RedCap positioning.
* Recommended WF
	+ Discuss the option(s).

**Issue 2-1-1-3: Mapping between PRS configuration and number of hops per slot in core requirements.**

* Proposals:
	+ Option 1: Huawei, HiSilicon
		- Confirm Table 1 for mapping between PRS configuration and number of hops per slot

Table 1: mapping between PRS configuration and number of hops per slot, version 1

|  |  |  |  |
| --- | --- | --- | --- |
| $$RRT\_{FH}$$ | **(comb size, Number of PRS symbols)** | **Applicable number of hops per slot** $\left(N\_{hops}^{slot}\right)$ | **Applicable length per hop (**$T\_{hop}$**) in number of symbols** |
| $$RRT\_{FH}\leq 2 symbols$$ | [(≤ 2, 12) with SCS 15kHz, 30kHz, 60kHz in FR2, 120kHz] | 2 | 7 |
| All others | 1 | 14 |
| $$2 symbols <RRT\_{FH}\leq 6 symbols$$ | (≤ 6, any) | 1 | 14 |
| (12, 12) | ½ | 28 |
| $$RRT\_{FH}>6 symbols$$ | Any combination | ½ | 28 |

* Recommended WF
	+ Discuss the option(s).

**Issue 2-1-1-4: Update to RAN4 UE feature list.**

* Proposals
	+ Option 1: E///
		- Pre-requisite groups for RAN4 FGs 37-1 is updated to “RAN1 feature 28-1 **or 48-1**, 27-3-1, 41-5-1”.
		- Pre-requisite groups for RAN4 FG 37-1A is updated to “ RAN1 feature 28-1 **or 48-1**, 27-3-1, 41-5-1”.
* Tentative agreement:
	+ *RAN4 UE feature list for RedCap positioning is updated to align with the RAN1 UE feature list for RedCap positioning.*
		- *Pre-requisite groups for RAN4 FGs 37-1 is updated to “RAN1 feature 28-1* ***or 48-1****, 27-3-1, 41-5-1”.*
		- *Pre-requisite groups for RAN4 FG 37-1A is updated to “ RAN1 feature 28-1* ***or 48-1****, 27-3-1, 41-5-1”.*
* Recommended WF
	+ *Agree on tentative agreement*.

**Issue 2-1-1-5: Number of RX FH in RRC\_INACTIVE/IDLE state.**

* Proposals
	+ Option 1: ZTE
		- The number of Rx hops measured by the RedCap UE in Inactive/Idle mode is given by
			* $N\_{hops}=min\left(N\_{hops,effect}, N\_{hops, max}\right)$

where

* + - * $N\_{hops, max}$ is the maximum number of Rx hops signaled in the UE capability (FG 41-5-1a for INACTIVE state and FG 41-5-1b for IDLE state).
			* $N\_{hops, effect}$ is the effective number of Rx hops within a time window.
* Recommended WF
	+ It is moderator’s understanding that this issue has already been resolved in the Draft Big CR endorsed in RAN4#110bis.
	+ No further discussion on this issue.

### Sub-Topic: RRM core requirement maintenance for PRS/SRS bandwidth aggregation

**Issue 2-1-2-1: Clarification regarding nominal channel spacing in core requirements for PRS aggregation.**

* Proposals
	+ Option 1: CATT
		- The clarification regarding the nominal channel spacing can be captured in performance part to make this feature clearer in specification.
* Tentative agreement:
	+ *The clarification regarding the nominal channel spacing is captured in the performance requirement part of the specification*.
* Recommended WF
	+ *Agree on tentative agreement*.

**Issue 2-1-2-2: Interruption delay requirement for SRS aggregation.**

* Proposals
	+ Option 1: CATT
		- RAN4 do not need to define interruption requirements for SRS transmission for BW aggregation on CC without PUSCH/PUCCH.
	+ Option 2: HW
		- RAN4 to define interruption requirements for SRS CA based on existing requirements for SRS carrier switching and SRS antenna switching.
	+ Option 3: E///
		- For UEs supporting guard period values {30µs, 100µs, 140µs, 200µs} interruption lengths are defined by reusing the values in 8.2.2.2.9 of TS 38.133 for SRS aggregation.
* Tentative agreement:
	+ *RAN4 to define interruption requirements for SRS CA. The values for SRS carrier switching is used.*
		- *FFS: whether to consider interruption due to SRS antenna switching for SRS aggregation.*
* Recommended WF
	+ *Agree on tentative agreement*.

**Issue 2-1-2-3: Core requirement for PRS-RSRP/RSRPP measurement based on bandwidth aggregation.**

* Proposals
	+ Option 1: OPPO, HW
		- Core requirement for timing measurements (RSTD or UE Rx-Tx) based on aggregated carriers/PFLs apply to PRS-RSRP/RSRPP, when UE reports PRS-RSRP/RSRPP together with the timing measurements (RSTD or UE Rx-Tx) based on the aggregated carriers/PFLs.
* Tentative agreement:
	+ *Core requirement for timing measurements (RSTD or UE Rx-Tx) based on aggregated carriers/PFLs apply to PRS-RSRP/RSRPP, when UE reports PRS-RSRP/RSRPP together with the timing measurements (RSTD or UE Rx-Tx) based on the aggregated carriers/PFLs*.
* Recommended WF
	+ *Agree on tentative agreement*.

**Issue 2-1-2-4: Applicability of core requirements for positioning measurements based on bandwidth aggregation.**

* Proposals
	+ Option 1: OPPO
		- Requirements for aggregate measurement are applicable to PRS resources in the resource sets that are indicated to be linked, provided that the alignment conditions defined by RAN1 are met.
* Recommended WF
	+ The following text in the Draft Big CR endorsed in RAN4#110bis already clarifies the applicability of the core requirements for positioning measurements based on the bandwidth aggregation.
	+ “*The requirements in this clause for aggregated measurements apply provided that the linked PRS resource sets on multiple PFLs for aggregated measurements are transmitted by the TRP using single Tx chain as defined in clause 5.1.6.5.3 in TS 38.214 [26].*”
	+ No further discussion on this issue.

## DraftCRs

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Title** |
| [**R4-2407039**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407039.zip) | **BeammWave** | **(NR\_Pos\_enh2-Core) 38.133 CR addressing the use of expected to in normative text** |
| [**R4-2407789**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407789.zip) | **BeammWave, Nokia** | **(NR\_Pos\_enh2-Core) 38.133 CR addressing the use of expected to in normative text** |
| [**R4-2407833**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407833.zip) | **Xiaomi** | **draftCR for RedCap postioing requirements in RRC\_Idle** |
| [**R4-2409267**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409267.zip) | **Huawei, HiSilicon** | **draftCR on RRM requirements for RedCap positioning** |
| [**R4-2409268**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409268.zip) | **Huawei, HiSilicon** | **draftCR on RRM requirements for PRS CA** |
| [**R4-2409584**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409584.zip) | **Ericsson** | **DraftCR to 38.133 on core requirements for bandwidth aggregation for positioning measurements** |
| [**R4-2409585**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409585.zip) | **Ericsson** | **DraftCR to 38.133 on core requirements for RedCap positioning** |

# Topic 3: General aspects for performance requirement (AI 7.12.2.1)

## Contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2409269**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409269.zip) | **Huawei, HiSilicon** | **Proposal 1: RAN4 to define new TCs for RRC\_IDLE or to make RRC\_INACTIVE TCs applicable for RRC\_IDLE. FFS whether to introduce RRC\_IDLE TCs for all or a subset of RRC\_INACTIVE TCs.****Proposal 2: Extend the following R17 testing applicability to delay testing of RedCap positioning with and without FH, PRS CA, carrier phase measurement, PRS measurement with eDRX*** **For both RRC\_INACTIVE and RRC\_CONNECTED: A UE capable of both PRS-RSRP and PRS-RSRPP measurements is required to pass either PRS-RSRP measurement delay test or PRS-RSRPP measurement delay test.**
* **For RRC\_INACTIVE: A UE capable of both RSTD and UE Rx-Tx time difference measurements is required to pass either RSTD measurement delay test or UE Rx-Tx time difference measurement delay test.**

**Proposal 3: For a RRC\_INACTIVE TC that UE needs to pass based on testing applicability, if UE supports the measurement in RRC\_IDLE and the corresponding RRC\_IDLE TC exists, then UE is only required to pass the RRC\_IDLE TC.** |
| [**R4-2409586**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409586.zip) | **Ericsson** | **Updated work split on test cases for RedCap positioning** |

**Issue 3-1-1: Updated work split on test cases for RedCap positioning.**

* Proposals
	+ Option 1: E///
		- Clause numbers for RedCap positioning test cases in R4-2406382 are updated to align with the other existing test cases for RedCap.
* Tentative agreement
	+ *Updated work split document on test cases for RedCap positioning is approved*.
* Recommended WF
	+ *Agree on tentative agreement*.

**Issue 3-1-2: Test cases for RRC\_IDLE mode.**

* Proposals
	+ Option 1: HW
		- RAN4 to define new TCs for RRC\_IDLE or to make RRC\_INACTIVE TCs applicable for RRC\_IDLE. FFS whether to introduce RRC\_IDLE TCs for all or a subset of RRC\_INACTIVE TCs.
* Tentative agreement:
	+ *RAN4 to define new TCs for RRC\_IDLE or to make RRC\_INACTIVE TCs applicable for RRC\_IDLE. FFS whether to introduce RRC\_IDLE TCs for all or a subset of RRC\_INACTIVE TCs*.
* Recommended WF
	+ *Agree on tentative agreement*.

**Issue 3-1-3: Testing principles for positioning TCs.**

* Proposals
	+ Option 1: HW
		- Extend the following R17 testing applicability to delay testing of RedCap positioning with and without FH, PRS CA, carrier phase measurement, PRS measurement with eDRX
		- For both RRC\_INACTIVE and RRC\_CONNECTED: A UE capable of both PRS-RSRP and PRS-RSRPP measurements is required to pass either PRS-RSRP measurement delay test or PRS-RSRPP measurement delay test.
		- For RRC\_INACTIVE: A UE capable of both RSTD and UE Rx-Tx time difference measurements is required to pass either RSTD measurement delay test or UE Rx-Tx time difference measurement delay test.
* Recommended WF
	+ DraftCR R4-2409587 contains the testing principles for positioning TCs including TC for RedCap, TC for PRS aggregation, TC for LPHAP, and TC for CPP.
	+ Proponent to check if DraftCR is OK.

**Issue 3-1-4: Testing principles for positioning TCs in RRC\_IDLE mode.**

* Proposals
	+ Option 1: HW
		- For a RRC\_INACTIVE TC that UE needs to pass based on testing applicability, if UE supports the measurement in RRC\_IDLE and the corresponding RRC\_IDLE TC exists, then UE is only required to pass the RRC\_IDLE TC.
* Recommended WF
	+ Discussion on this issue rely on the progress made on **Issue 3-1-2**.

## DraftCRs

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2409270**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409270.zip) | **Huawei, HiSilicon** | **draftCR on time window configuration** |
| [**R4-2409369**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409369.zip) | **Ericsson** | **Draft Big CR to 38.133 on RRM performance requirements for Positioning** |
| [**R4-2409587**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409587.zip) | **Ericsson** | **DraftCR to 38.133 on general aspects related to performance requirement** |

# Topic 4: Performance requirement: RedCap positioning (7.12.2.4)

## Contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2407493**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407493.zip) | **CATT** | **Proposal 1: The structure of accuracy tables for measurements with FH in different clauses shall be aligned, and example tables for accuracy requirements with FH for 2Rx RedCap in FR1 and FR2 are given below:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Accuracy | PRS Ês/Iot | PRS SCS | BW per hop | Total PRS bandwidth |
| Tc | dB | kHz | MHz | PRB |
| **TBD** | **(PRS Ês/Iot)ref ≥-6dB** **(PRS Ês/Iot)*i* ≥-13dB** | **15** | **10** | **≥ 52** |
| **TBD** | **≥ 104** |
| **TBD** | **≥ 272** |
| **TBD** | **30** | **20** | **≥ 48** |
| **TBD** | **≥ 132** |
| **TBD** | **≥ 272** |
| **TBD** | **60** | **20** | **≥ 24** |
| **TBD** | **≥ 64** |
| **TBD** | **≥ 132** |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Accuracy | PRS Ês/Iot | PRS SCS | BW per hop | Total PRS bandwidth |
| Tc | dB | kHz | MHz | PRB |
| **TBD** | **(PRS Ês/Iot)ref ≥-6dB** **(PRS Ês/Iot)*i* ≥-13dB** | **60** | **50** | **≥ 64** |
| **TBD** | **≥ 132** |
| **TBD** | **≥ 272** |
| **TBD** | **120** | **100** | **≥ 64** |
| **TBD** | **≥ 128** |
| **TBD** | **≥ 272** |

**The rest of structure can reuse the applicable parts in the existing accuracy tables, for example, Io range, etc.** |
| [**R4-2409275**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409275.zip) | **Huawei, HiSilicon** | **Proposal 1: Define accuracy requirements for non-FH case based on following BW groups.****- 15kHz: ≥24, ≥[52] and [104] RBs****- 30kHz: ≥24 and [48] RBs****- 60kHz (FR1): [24] RBs****- 60kHz (FR2): ≥24, ≥[64] and [132] RBs****- 120kHz: ≥32 and [64] RBs****Proposal 2: For accuracy requirements for non-FH case,****- 2RX: re-use existing accuracy numbers for the corresponding BW groups****- 1RX: derive accuracy numbers from simulation results****Proposal 3: Define accuracy requirements for FH case based on following BW groups.****- 15kHz: per-hop BW ≥ 52 RB, total BW = 268 RB****- 30kHz: per-hop BW ≥ 51 RB, total BW = 272 RB****- 60kHz (FR1): per-hop BW ≥ 24 RB, total BW = 132 RB****- 60kHz (FR2): per-hop BW ≥ 66 RB, total BW = 264 RB****- 120kHz: per-hop BW ≥ 66 RB, total BW = 264 RB****Proposal 4: For accuracy requirements for non-FH case, derive accuracy numbers from simulation results. The requirements apply provided that the BWtotal defined in clause core requirements is no less than the total BW in Proposal 3.****Proposal 5: Use the following PRS RMC for measurement delay TCs****- Non-FH: small BW (existing RMC)****- FH: large BW with repetitions (new RMC)****Proposal 6: Use the following PRS RMC for measurement accuracy TCs****- Non-FH (2 BWs): small BW (existing RMC) and medium BW (104/48/64 RB for 15/30/120kHz)****- FH (1 BW): large BW with repetitions (new RMC)****Proposal 7: Discuss how to handle PRS BW for FH TCs and clarify the definition of Io.** **- Option 1: consider the BW in test configuration as UE BW and cell BW can be larger****- Option 2: consider PRS are transmitted from non-serving cells (the cell BW of the non-serving cells need to be defined), and BW in test configuration is only for serving cell.** |
| [**R4-2409589**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409589.zip) | **Ericsson** | **Proposal 1: Accuracy requirements are different for the cases with and without Rx FH for the scenario where the total PRS BW after all hops is larger than the PRS BW without Rx FH.****Proposal 2: Accuracy requirements can be same for the cases with and without Rx FH for the scenario where the total PRS BW after all hops is equal to the PRS BW without Rx FH.** |

### Sub-Topic: Performance requirements

**Issue 4-1-1-1: Bandwidth configuration for accuracy requirement for positioning measurement with RX FH for RedCap positioning.**

* Proposals
	+ Option 1: CATT
		- The structure of accuracy tables for measurements with FH in different clauses shall be aligned, and example tables for accuracy requirements with FH for 2Rx RedCap in FR1 and FR2 are given below:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Accuracy | PRS Ês/Iot | PRS SCS | BW per hop | Total PRS bandwidth |
| Tc | dB | kHz | MHz | PRB |
| TBD | (PRS Ês/Iot)ref ≥-6dB (PRS Ês/Iot)i ≥-13dB | 15 | 10 | ≥ 52 |
| TBD | ≥ 104 |
| TBD | ≥ 272 |
| TBD | 30 | 20 | ≥ 48 |
| TBD | ≥ 132 |
| TBD | ≥ 272 |
| TBD | 60 | 20 | ≥ 24 |
| TBD | ≥ 64 |
| TBD | ≥ 132 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Accuracy | PRS Ês/Iot | PRS SCS | BW per hop | Total PRS bandwidth |
| Tc | dB | kHz | MHz | PRB |
| TBD | (PRS Ês/Iot)ref ≥-6dB (PRS Ês/Iot)i ≥-13dB | 60 | 50 | ≥ 64 |
| TBD | ≥ 132 |
| TBD | ≥ 272 |
| TBD | 120 | 100 | ≥ 64 |
| TBD | ≥ 128 |
| TBD | ≥ 272 |

* + - The rest of structure can reuse the applicable parts in the existing accuracy tables, for example, Io range, etc.
	+ Option 2: HW
		- Define accuracy requirements for FH case based on following BW groups.

- 15kHz: per-hop BW ≥ 52 RB, total BW = 268 RB

- 30kHz: per-hop BW ≥ 51 RB, total BW = 272 RB

- 60kHz (FR1): per-hop BW ≥ 24 RB, total BW = 132 RB

- 60kHz (FR2): per-hop BW ≥ 66 RB, total BW = 264 RB

- 120kHz: per-hop BW ≥ 66 RB, total BW = 264 RB.

* Recommended WF
	+ Discuss the option(s).

**Issue 4-1-1-2: Bandwidth configuration for accuracy requirement for positioning measurement without RX FH for RedCap positioning.**

* Proposals
	+ Option 1: HW
		- Define accuracy requirements for non-FH case based on following BW groups.

- 15kHz: ≥24, ≥[52] and [104] RBs

- 30kHz: ≥24 and [48] RBs

- 60kHz (FR1): [24] RBs

- 60kHz (FR2): ≥24, ≥[64] and [132] RBs

- 120kHz: ≥32 and [64] RBs.

* For accuracy requirements for non-FH case,

- 2RX: re-use existing accuracy numbers for the corresponding BW groups

- 1RX: derive accuracy numbers from simulation results

* For accuracy requirements for non-FH case, derive accuracy numbers from simulation results. The requirements apply provided that the BWtotal defined in clause core requirements is no less than the total BW in option 2 in Issue 4-1-1-1.
* Recommended WF
	+ Discuss the option(s).

**Issue 4-1-1-3: Accuracy requirement for RedCap positioning.**

* Proposals
	+ Option 1: E///
		- Accuracy requirements are different for the cases with and without Rx FH for the scenario where the total PRS BW after all hops is larger than the PRS BW without Rx FH.
		- Accuracy requirements can be same for the cases with and without Rx FH for the scenario where the total PRS BW after all hops is equal to the PRS BW without Rx FH.
* Recommended WF
	+ Discuss the option(s).

### Sub-Topic: Issues related to test cases

**Issue 4-1-2-1: PRS RMC for RedCap positioning TCs.**

* Proposals
	+ Option 1: HW
* Use the following PRS RMC for measurement delay TCs

- Non-FH: small BW (existing RMC)

- FH: large BW with repetitions (new RMC)

* Use the following PRS RMC for measurement accuracy TCs

- Non-FH (2 BWs): small BW (existing RMC) and medium BW (104/48/64 RB for 15/30/120kHz)

- FH (1 BW): large BW with repetitions (new RMC)

* Recommended WF
	+ Discuss the option(s).

**Issue 4-1-2-2: PRS bandwidth for FH TCs for RedCap positioning.**

* Proposals
	+ Option 1: HW
		- Discuss how to handle PRS BW for FH TCs and clarify the definition of Io.
			* Option 1: consider the BW in test configuration as UE BW and cell BW can be larger
			* Option 2: consider PRS are transmitted from non-serving cells (the cell BW of the non-serving cells need to be defined), and BW in test configuration is only for serving cell
* Recommended WF
	+ Discuss the option(s).

## Contributions with simulation results

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Title** |
| **R4-2409276** | **Huawei, HiSilicon** | **additional simulation results for RedCap positioning** |

## DraftCRs

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2407488**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407488.zip) | **CATT** | **(2-4, 3-21, 22, 23, 24) Draft CR on PRS-RSRPP performance requirements and UE Rx-Tx measurement delay test cases for RedCap positioning** |
| [**R4-2407882**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407882.zip) | **OPPO** | **[TC 3-29 and 3-30] Draft CR on TC for PRS-RSRPP delay with Rx FH in RRC CONNECTED** |
| [**R4-2408488**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2408488.zip) | **Intel Corporation** | **(3-17~20) Test cases for RedCap RSTD measurement delay with frequency hopping** |
| [**R4-2409277**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409277.zip) | **Huawei, HiSilicon** | **draftCR on performance requirements for RedCap positioning** |
| [**R4-2409590**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409590.zip) | **Ericsson** | **DraftCR to 38.133 on performance requirements for Rel.18 RedCap positioning** |
| [**R4-2409650**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409650.zip) | **Nokia** | **(NR\_pos\_enh2-Perf) (3-9, 3-10) PRS-RSRP measurement delay test case for RedCap positioning without Rx FH in RRC CONNECTED state in FR1 and FR2** |
| [**R4-2409700**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409700.zip) | **ZTECorporation,Sanechips** | **Draft CR for test case on RedCap positioning\_PRS RSRPP** |
| [**R4-2409731**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409731.zip) | **MediaTek inc.** | **draftCR (3-1)(3-3)(4-1)(4-3) TCs for RedCap positioning without FH on RSTD measurement delay and accuracy in FR1** |

# Topic 5: Performance requirements for PRS/SRS bandwidth aggregation (AI 7.12.2.5)

## Contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2407494**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407494.zip) | **CATT** | **Proposal 1: Companies to align the structure of accuracy tables in different clauses, and the following tables are proposed as examples:** **Table 1: RSTD measurements with 2 PFLs aggregation in AWGN in FR1 with 4 samples**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Accuracy | PRS Ês/Iot | PRS SCS | BW per PFL | Total PRS bandwidth |
| Tc | dB | kHz | PRB | PRB |
| **TBD** | **(PRS Ês/Iot)ref ≥-6dB** **(PRS Ês/Iot)i ≥-13dB** | **15** | **104** | **≥ 208** |
| **TBD** | **30** | **132** | **≥ 264** |
| **TBD** | **272** | **≥ 544** |
| **TBD** | **60** | **64** | **≥ 128** |
| **TBD** | **132** | **≥ 264** |

**Table 2: RSTD measurements with 3 PFLs aggregation in AWGN in FR1 with 4 samples**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Accuracy | PRS Ês/Iot | PRS SCS | BW per PFL | Total PRS bandwidth |
| Tc | dB | kHz | PRB | PRB |
| **TBD** | **(PRS Ês/Iot)ref ≥-6dB** **(PRS Ês/Iot)i ≥-13dB** | **15** | **104** | **≥ 312** |
| **TBD** | **30** | **132** | **≥ 396** |
| **TBD** | **272** | **≥ 816** |
| **TBD** | **60** | **64** | **≥ 192** |
| **TBD** | **132** | **≥ 396** |

**Table 3: RSTD measurements with 2 PFLs aggregation in AWGN in FR2 with 4 samples**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Accuracy | PRS Ês/Iot | PRS SCS | BW per PFL | Total PRS bandwidth |
| Tc | dB | kHz | MHz | PRB |
| **TBD** | **(PRS Ês/Iot)ref ≥-6dB** **(PRS Ês/Iot)i ≥-13dB** | **60** | **64** | **≥ 128** |
| **TBD** | **132** | **≥ 264** |
| **TBD** | **120** | **64** | **≥ 128** |
| **TBD** | **128** | **≥ 256** |
| **TBD** | **272** | **≥ 544** |

**Table 4: RSTD measurements with 3 PFLs aggregation in AWGN in FR2 with 4 samples**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Accuracy | PRS Ês/Iot | PRS SCS | BW per PFL | Total PRS bandwidth |
| Tc | dB | kHz | MHz | PRB |
| **TBD** | **(PRS Ês/Iot)ref ≥-6dB** **(PRS Ês/Iot)i ≥-13dB** | **60** | **64** | **≥ 192** |
| **TBD** | **132** | **≥ 396** |
| **TBD** | **120** | **64** | **≥ 192** |
| **TBD** | **128** | **≥ 384** |
| **TBD** | **272** | **≥ 816** |

**Proposal 2: The requirements are defined, based on the following principle: For a given side condition and propagation condition, existing accuracy requirement applies for the total aggregated BW to the PRS-RSRP/ RSRPP measurements in case of PRS BW aggregation.** **Proposal 3: Keep the consistency of measurement accuracy requirements and do not include baseband sampling rate into measurement accuracy tables.** |
| [**R4-2407883**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407883.zip) | **OPPO** | **Proposal 1: The existing accuracy requirement for the largest PRS BW among the aggregated PFLs applies to the PRS-RSRP/RSRPP measurements in case of PRS BW aggregation.****Proposal 2: Existing report mapping table is used for PRS-RSRP/RSRPP measurement.****Proposal 3: Define accuracy requirements based on the number of PFLs.****Proposal 4: Not consider baseband sampling rate when define accuracy requirements.** |
| [**R4-2407971**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407971.zip) | **Qualcomm Incorporated** | **Proposal 1: Define RSTD and UE Rx-Tx measurement accuracy requirements with PRS BW aggregation for aggregated PFLs of equal bandwidth, with the per-PFL bandwidth values agreed in the simulation assumptions.****Proposal 2: For PRS RSRP(P) measurements with PRS BW aggregation, the applicable measurement accuracy requirement is based on the largest bandwidth among the aggregated PFLs.****Proposal 3: RSTD and UE Rx-Tx measurement accuracy requirements with PRS BW aggregation do not depend on sampling rate. Sampling rate assumptions for RAN4 simulation purposes may be clarified.** |
| [**R4-2408298**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2408298.zip) | **vivo** | **Proposal 1: Existing accuracy requirement applies for the total aggregated BW to the PRS-RSRP/RSRPP measurements in case of PRS BW aggregation.** |
| [**R4-2409165**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409165.zip) | **Nokia** | 1. **To define the performance requirements for PRS BW aggregation, use 4 measurement samples as a baseline.**
2. **The measurement accuracy requirement for RSTD/UE Rx-Tx time difference should depend on the baseband sampling rate as well as the number of PFLs.**
 |
| [**R4-2409278**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409278.zip) | **Huawei, HiSilicon** | **Proposal 1: RAN4 not to define accuracy requirements for per-PFL BW of 400MHz.****Proposal 2: Accuracy requirements are defined on combination (per-PFL BW, number of PFLs).** **Proposal 3: For PRS-RSRP(P), adopt option 2 for re-using existing requirements:****For a given side condition and propagation condition, existing accuracy requirement for the total aggregated BW applies to the PRS-RSRP/RSRPP measurements in case of PRS BW aggregation.****Proposal 4: Define the following requirement applicability for PRS CA*** **The requirements for 3-PFL apply provided that both the reference TRP and the target TRP are measured on linked resources across 3 PFLs.**
* **The requirements for 2-PFL apply provided that one of the reference TRP and the target TRP is measured on linked resources across 2 PFLs, and the other TRP is measured on linked resources across 2 or 3 PFLs.**
* **When one of the reference TRP and the target TRP is measured on non-linked resource on a single PFL, the accuracy requirements for single PFL shall apply.**

**Proposal 5: RAN4 to further discuss the RF calibration margin for RSTD and UE Rx-Tx.****Proposal 6: For RRM test for PRS CA, only set up the PRS resources for aggregate measurement.****Proposal 7: For accuracy TCs, test one BW based on the largest per-PFL BW in accuracy requirements. Define new PRS RMC for 30kHz SCS with 272 RB.** |
| [**R4-2409591**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409591.zip) | **Ericsson** | 1. **The performance requirements for PRS-RSRP and PRS-RSRPP measurements in case of PRS BW aggregation are defined by reusing the existing requirements for PRS-RSRP and PRS-RSRPP measurements based on the following principle: *For a given side condition and propagation condition, existing accuracy requirement applies for the total aggregated BW to the PRS-RSRP/RSRPP measurements in case of PRS BW aggregation*.**
2. **Accuracy requirement for RSTD/UE Rx-Tx time difference measurement is not defined based on the UE baseband sampling rate.**
3. **Accuracy requirements are defined separately for the 2 PFL and 3 PFL cases.**
4. **Test cases for PRS aggregation are defined for 2PFL case only. In the test cases, the existing PRS configuration is reused to configure PRS resources on a per PFL basis.**
 |

### Sub-Topic: Performance Requirements for PRS Aggregation

**Issue 5-1-1-1: Bandwidth configuration for PRS aggregation based measurement accuracy requirement.**

* Proposals
	+ Option 1: CATT
		- Companies to align the structure of accuracy tables in different clauses, and the following tables are proposed as examples:

Table 1: RSTD measurements with 2 PFLs aggregation in AWGN in FR1 with 4 samples

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Accuracy | PRS Ês/Iot | PRS SCS | BW per PFL | Total PRS bandwidth |
| Tc | dB | kHz | PRB | PRB |
| TBD | (PRS Ês/Iot)ref ≥-6dB (PRS Ês/Iot)i ≥-13dB | 15 | 104 | ≥ 208 |
| TBD | 30 | 132 | ≥ 264 |
| TBD | 272 | ≥ 544 |
| TBD | 60 | 64 | ≥ 128 |
| TBD | 132 | ≥ 264 |

Table 2: RSTD measurements with 3 PFLs aggregation in AWGN in FR1 with 4 samples

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Accuracy | PRS Ês/Iot | PRS SCS | BW per PFL | Total PRS bandwidth |
| Tc | dB | kHz | PRB | PRB |
| TBD | (PRS Ês/Iot)ref ≥-6dB (PRS Ês/Iot)i ≥-13dB | 15 | 104 | ≥ 312 |
| TBD | 30 | 132 | ≥ 396 |
| TBD | 272 | ≥ 816 |
| TBD | 60 | 64 | ≥ 192 |
| TBD | 132 | ≥ 396 |

Table 3: RSTD measurements with 2 PFLs aggregation in AWGN in FR2 with 4 samples

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Accuracy | PRS Ês/Iot | PRS SCS | BW per PFL | Total PRS bandwidth |
| Tc | dB | kHz | MHz | PRB |
| TBD | (PRS Ês/Iot)ref ≥-6dB (PRS Ês/Iot)i ≥-13dB | 60 | 64 | ≥ 128 |
| TBD | 132 | ≥ 264 |
| TBD | 120 | 64 | ≥ 128 |
| TBD | 128 | ≥ 256 |
| TBD | 272 | ≥ 544 |

Table 4: RSTD measurements with 3 PFLs aggregation in AWGN in FR2 with 4 samples

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Accuracy | PRS Ês/Iot | PRS SCS | BW per PFL | Total PRS bandwidth |
| Tc | dB | kHz | MHz | PRB |
| TBD | (PRS Ês/Iot)ref ≥-6dB (PRS Ês/Iot)i ≥-13dB | 60 | 64 | ≥ 192 |
| TBD | 132 | ≥ 396 |
| TBD | 120 | 64 | ≥ 192 |
| TBD | 128 | ≥ 384 |
| TBD | 272 | ≥ 816 |

* + Option 2: QC
		- Define RSTD and UE Rx-Tx measurement accuracy requirements with PRS BW aggregation for aggregated PFLs of equal bandwidth, with the per-PFL bandwidth values agreed in the simulation assumptions.
	+ Option 3: HW
		- Accuracy requirements are defined on combination (per-PFL BW, number of PFLs).
* Tentative agreement:
	+ *Define RSTD and UE Rx-Tx measurement accuracy requirements with PRS BW aggregation for aggregated PFLs of equal bandwidth, with the per-PFL bandwidth values agreed in the simulation assumptions.*
	+ *Accuracy requirements are defined on combination (per-PFL BW, number of PFLs).*
* Recommended WF
	+ *Agree on tentative agreement*.

**Issue 5-1-1-2: Accuracy requirement for PRS-RSRP/RSRPP measurement based on PRS aggregation.**

* Proposals
	+ Option 1: CATT, Vivo, HW, E///
		- The requirements are defined, based on the following principle: For a given side condition and propagation condition, existing accuracy requirement applies for the total aggregated BW to the PRS-RSRP/ RSRPP measurements in case of PRS BW aggregation.
	+ Option 2: OPPO, QC
		- The existing accuracy requirement for the largest PRS BW among the aggregated PFLs applies to the PRS-RSRP/RSRPP measurements in case of PRS BW aggregation.
* Tentative agreement:
	+ *The requirements are defined, based on the following principle: For a given side condition and propagation condition, existing accuracy requirement applies for the total aggregated BW to the PRS-RSRP/ RSRPP measurements in case of PRS BW aggregation.*
* Recommended WF
	+ *Agree on tentative agreement*.

**Issue 5-1-1-3: Report mapping for PRS-RSRP/RSRPP measurement based on PRS aggregation.**

* Proposals
	+ Option 1: OPPO
		- Existing report mapping table is used for PRS-RSRP/RSRPP measurement.
* Tentative agreement:
	+ *Existing report mapping table is used for PRS-RSRP/RSRPP measurement*.
* Recommended WF
	+ *Agree on tentative agreement*.

**Issue 5-1-1-4: Accuracy requirement based on baseband sampling rate for measurements based on PRS aggregation.**

* Proposals
	+ Option 1: CATT
		- Keep the consistency of measurement accuracy requirements and do not include baseband sampling rate into measurement accuracy tables.
	+ Option 1a: QC
		- * RSTD and UE Rx-Tx measurement accuracy requirements with PRS BW aggregation do not depend on sampling rate. Sampling rate assumptions for RAN4 simulation purposes may be clarified.
	+ Option 1b: E///
		- * Accuracy requirement for RSTD/UE Rx-Tx time difference measurement is not defined based on the UE baseband sampling rate.
	+ Option 2: Nokia
		- The measurement accuracy requirement for RSTD/UE Rx-Tx time difference should depend on the baseband sampling rate as well as the number of PFLs.
* Tentative agreement:
	+ *Accuracy requirement for RSTD and UE Rx-Tx measurements based on PRS aggregation is not defined based on the baseband sampling rate. Sampling rate assumptions are for RAN4 simulation purposes.*
* Recommended WF
	+ *Agree on tentative agreement.*

**Issue 5-1-1-5: Accuracy requirements for 2 PFL and 3 PFL cases.**

* Proposals
	+ Option 1: OPPO, E///
		- Define accuracy requirements based on the number of PFLs.
* Tentative agreement:
	+ *Accuracy requirements for RSTD and UE Rx-Tx measurements based on PRS aggregation are defined based on the number of PFLs.*
* Recommended WF
	+ *Agree on tentative agreement.*

**Issue 5-1-1-6: 4-sample as a baseline for PRS aggregation based measurement accuracy requirement.**

* Proposals
	+ Option 1: Nokia
		- To define the performance requirements for PRS BW aggregation, use 4 measurement samples as a baseline.
* Recommended WF
	+ *The following agreement was reached in RAN4#110bis.*

***Agreement from RAN4#110bis****:*

*The number of samples in accuracy requirements for PRS bandwidth aggregation:*

* *Option 1: both reduced number of samples and 4 samples.*
	+ *No further discussion on this issue.*

**Issue 5-1-1-7: Accuracy requirement for per PFL PRS bandwidth of 400MHz.**

* Proposals
	+ Option 1: HW
		- RAN4 not to define accuracy requirements for per-PFL BW of 400MHz.
* Tentative agreement:
	+ *RAN4 not to define accuracy requirements for per-PFL BW of 400MHz.*
* Recommended WF
	+ *Agree on tentative agreement*

**Issue 5-1-1-8: Applicability of requirements for PRS aggregation.**

* Proposals
	+ Option 1: HW
		- Define the following requirement applicability for PRS CA
			* The requirements for 3-PFL apply provided that both the reference TRP and the target TRP are measured on linked resources across 3 PFLs.
			* The requirements for 2-PFL apply provided that one of the reference TRP and the target TRP is measured on linked resources across 2 PFLs, and the other TRP is measured on linked resources across 2 or 3 PFLs.
			* When one of the reference TRP and the target TRP is measured on non-linked resource on a single PFL, the accuracy requirements for single PFL shall apply.
* Recommended WF
	+ Discuss the option(s).

**Issue 5-1-1-9: RF calibration margin for positioning measurements based on bandwidth aggregation.**

* Proposals
	+ Option 1: HW
		- RAN4 to further discuss the RF calibration margin for RSTD and UE Rx-Tx.
* Recommended WF
	+ Discuss the option(s).

### Sub-Topic: Test cases for PRS Aggregation

**Issue 5-1-2-1: PRS resource set up for measurement delay test cases.**

* Proposals
	+ Option 1: HW
		- For RRM test for PRS CA, only set up the PRS resources for aggregate measurement.
* Tentative agreement:
	+ *For RRM test for PRS CA, only set up the PRS resources for aggregate measurement.*
* Recommended WF
	+ *Agree on tentative agreement*

**Issue 5-1-2-2: PRS resource set up for accuracy test cases.**

* Proposals
	+ Option 1: HW
		- For accuracy TCs, test one BW based on the largest per-PFL BW in accuracy requirements. Define new PRS RMC for 30kHz SCS with 272 RB.
	+ Option 2: E///
		- Test cases for PRS aggregation are defined for 2PFL case only. In the test cases, the existing PRS configuration is reused to configure PRS resources on a per PFL basis.
* Recommended WF
	+ Discuss the option(s).

## Contributions related to simulation results.

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Title** |
| [**R4-2409165**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409165.zip) | **Nokia** | **Simulation results for PRS Bandwidth Aggregation** |

## DraftCRs

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Title** |
| [**R4-2407489**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407489.zip) | **CATT** | **(5-3, 4) Draft CR on RSTD measurement reporting delay test cases for PRS aggregation in FR1 and FR2 in RRC\_INACTIVE state** |
| [**R4-2407884**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407884.zip) | **OPPO** | **[2-6] Draft CR on PRS-RSRP Measurements Based on PRS BWA** |
| [**R4-2407973**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407973.zip) | **Qualcomm Incorporated** | **Draft CR – Test cases for UE Rx-Tx measurement delay with PRS BW aggregation, Sets 5-5, 5-6, 5-7, 5-8** |
| [**R4-2407974**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407974.zip) | **Qualcomm Incorporated** | **Draft CR – Performance requirements for UE Rx-Tx measurements with PRS bandwidth aggregation (Set 2-7)** |
| [**R4-2408295**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2408295.zip) | **vivo** | **Draft CR on PRS-RSRPP measurements based on PRS aggregation - set 2-8** |
| [**R4-2409279**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409279.zip) | **Huawei, HiSilicon** | **draftCR on performance requirements for PRS CA** |
| [**R4-2409592**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409592.zip) | **Ericsson** | **DraftCR to 38.133 to introduce test cases for PRS aggregation for positioning measurements** |