3GPP TSG-RAN WG4 Meeting #111 R4-240xxxx

Fukuoka City, Fukuoka , Japan, 20th – 24th May, 2024

**Agenda item:** 7.12.3

**Source:** Ericsson

**Title:** Ad hoc minutes for AH#1 on Rel-18 positioning (Monday)

**Document for:** Approval

# Introduction

The document contains discussions on the topics as indicated below.

Positioning RRM core requirements across the following 3 threads:

* Topic # 1: core [111][212] NR\_pos\_enh2\_part1 (-)
* Topic # 2: core [111][213] NR\_pos\_enh2\_part2 (-)
* Topic # 3: core [111][214] NR\_pos\_enh2\_part3 (-)

Positioning RRM performance across the following 3 threads:

* Topic # 4: perf [111][212] NR\_pos\_enh2\_part1 (Monday/May20)
* Topic # 5: perf [111][213] NR\_pos\_enh2\_part2 (Monday/May20, except SL positioning)
* Topic # 6: perf [111][214] NR\_pos\_enh2\_part3 (Monday/May20)

Documents for approval and draft CRs:

* Topic # 7: core draft CRs for all threads (-)
* Topic # 8: perf draft CRs for all threads (-)
* Topic # 9: other documents for approval, including updated work split (-)

# Topic #1: core [111][212] NR\_pos\_enh2\_part1

## RedCap positioning (Agenda 7.12.1.4)

Issues recommended for discussion by moderator: -

Issues prioritized during the AH: -

## PRS/SRS bandwidth aggregation (Agenda 7.12.1.4)

Issues recommended for discussion by moderator: -

Issues prioritized during the AH: -

# Topic #2: core [111][213] NR\_pos\_enh2\_part2

## SL positioning (Agenda 7.12.1.2)

Issues recommended for discussion by moderator: -

Issues prioritized during the AH: -

## Carrier phase positioning (Agenda 7.12.1.2)

Issues recommended for discussion by moderator: -

Issues prioritized during the AH: -

# Topic #3: core [111][214] NR\_pos\_enh2\_part3

## LPHAP (Agenda 7.12.1.3)

Issues recommended for discussion by moderator:

Issues prioritized during the AH: -

# Topic #4: performance [111][212] NR\_pos\_enh2\_part1

## General (Agenda 7.12.2.1)

Issues recommended for discussion by moderator:

* + 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

Issues prioritized during the AH: 3-1-1, 3-1-2, 3-1-4

### 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*.

Check for agreement:

* Updated work split document ([**R4-2409586**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409586.zip)) on test cases for RedCap positioning is approved.

Discussion:

Agreement:

Update the work split document as in [**R4-2409586**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409586.zip), for RedCap test cases.

### 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*.

Check for 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.*

Discussion:

* *RAN4 can down select:*
  + *Option 1: RAN4 to define new TCs for RRC\_IDLE, or*
  + *Option 2: to make RRC\_INACTIVE TCs applicable (with the reference to the proper requirements section in the test case) for RRC\_IDLE.*

Agreement:

* *Option 1: RAN4 to define new TCs for RRC\_IDLE*
* *Align with previous agreements, e.g., for LPHAP*
* *The TCs for RRC\_IDLE are to be based on the corresponding TCs for RRC\_INACTIVE, if such TCs exist, otherwise, new TCs are to be defined (e.g., for eDRX)*
  + *new clauses will be created, worksplit to be updated*

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

* Proposals
  + Option 1: HW
    - For an 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**.

Discussion:

Conclusion: To be discussed together with the worksplit in RAN4#111 and draft CRs in RAN4#112.

## RedCap positioning (Agenda 7.12.2.4)

Issues recommended for discussion by moderator:

* + 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

Issues prioritized during the AH: 4-1-1-1, 4-1-2-2, 4-1-2-1, 4-1-1-3.

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

***Related earlier agreements (RAN4#110-bis)****:*

* *Bandwidth for accuracy requirement for RedCap positioning:*
  + *Option 2c: combination (total measured PRS BW during all hops, per-hop BW), regardless of the overlapping BW size*
* *Accuracy requirement for PRS-RSRP and PRS-RSRPP with Rx FH*
  + *For PRS-RSRP and PRS-RSRPP measurements with FH, apply the measurement accuracy requirements without FH defined for the corresponding PRS BW per hop*
* 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.

* + - For accuracy requirements for 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).

Check for agreement:

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.

For accuracy requirements for 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 above.

Discussion:

Agreement:

Define accuracy requirements for FH case based on at least following BW groups:

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

- 30kHz: per-hop BW ≥ 52 RB, min total BW = [272] RB

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

- 60kHz (FR2): per-hop BW ≥ 68 RB, min total BW = [264] RB

- 120kHz: per-hop BW ≥ 68 RB, min total BW = [264] RB

FFS: additional BW configurations for accuracy requirements, e.g., smaller total BW.

Note: per-hop BW is to be converted in the accuracy requirements to BW in MHz and aligned with RAN2 signaling.

For accuracy requirements for 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 above.

### 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).

Discussion:

Conclusion: Collect feedback from TE vendors.

### 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).

Discussion:

Agreement:

For small BWs, reuse the existing one.

For larger BWs non-FH: new PRS RMC I to be defined (to be used for measurement accuracy TCs), e.g.:

* 104/48/64 RB for 15/30/120kHz, respectively

### 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).

Discussion: (relevant if option 2 [possibly with some updates] is chosen in issue 4-1-1-1)

Agreement:

Accuracy requirements are different from the legacy (more accurate than legacy) 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.

FFS: With some BW configurations, accuracy requirements can be same as legacy 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, if such exist.

## PRS/SRS bandwidth aggregation (Agenda 7.12.2.5)

Issues recommended for discussion by moderator:

* + 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

Issues prioritized during the AH: 5-1-1-1, 5-1-1-2, 5-1-1-4, 5-1-1-5, 5-1-1-8, 5-1-2-1.

### 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*

Check for 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).*

Discussion:

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 based on combination (per-PFL BW, number of PFLs).

### 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*.

Check for 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.*

Discussion:

Agreement:

The requirements are defined, based on the following principle:

* For a given side condition and propagation condition, existing legacy accuracy requirement corresponding (same or closest smaller) to the total aggregated BW applies also for the total aggregated BW to the PRS-RSRP/ RSRPP measurements in case of PRS BW aggregation.

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

* Proposals
  + Option 1: CATT, OPPO
    - 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.*

Check for 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.*

Discussion:

Agreement:

* Baseband sampling rate is not captured in accuracy requirements for RSTD and UE Rx-Tx measurements.
* Sampling rate assumptions are for RAN4 simulation purposes.

### 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.*

Check for agreement:

* *Accuracy requirements for RSTD and UE Rx-Tx measurements based on PRS aggregation are defined based on the number of PFLs.*
  + *Note: clarify “based on”*

Discussion:

Agreement:

* Define separate accuracy requirements for RSTD and UE Rx-Tx measurements for 2 and 3 aggregated PFLs.

### 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).

Discussion:

Agreement:

Define the following requirement applicability for RSTD with DL PRS CA:

* For RSTD with DL PRS aggregation, the accuracy requirement corresponding to the smallest BW between the reference and target TRP.
  + In the specification, adapt to the multi-PFL requirement wording from legacy requirements.

### 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*

Check for agreement:

* *For RRM test for PRS CA, only configure the PRS resources for aggregate measurement.*

Discussion:

Agreement:

For RRM delay and accuracy test cases with PRS CA, only configure the PRS resources for aggregate measurement.

# Topic #5: performance [111][213] NR\_pos\_enh2\_part2

## SL positioning (Agenda 7.12.2.2)

Issues recommended for discussion by moderator: Subtopic 1-2: Issue 1-2-1/2/3/4/5/6

Issues prioritized during the AH: -

## Carrier phase positioning (Agenda 7.12.2.6)

Issues recommended for discussion by moderator:

Subtopic 2-2: Issue 2-2-1/2/3

Issues prioritized during the AH: 2-2-1/2/3

### Issue 2-2-1: Whether to verify the accuracy of legacy measurements in RSCPD/RSCP TCs

|  |
| --- |
| Issue 4-1-7: Test requirements *Agreements in RAN4#110bis:*   * For carrier phase-based positioning, test cases are only defined for the case where the UE is configured to perform carrier phase measurement with legacy positioning measurements within the configured measurement time window. * Further discussion is needed on whether to verify in the RSCPD/RSCP TC the accuracy of the other measurement configured and reported together with RSCPD/RSCP. |

* Proposals
  + Option 1: (CATT, Ericsson, Nokia)
    - Verify both the accuracies of legacy measurements and CPP measurements in one TC with a 90% success rate to reflect UE’s real positioning performance in the deployment.
  + Option 2: (OPPO, Huawei, Nokia)
    - Not verify the accuracy requirements for legacy RSTD/Rx-Tx measurement in the RSCPD/RSCP TC.
* Recommended WF
  + Discuss the option(s).

Discussion:

Further discussion is needed.

### Issue 2-2-3: Test configurations

* Proposals
  + Option 1: (OPPO)
    - The periodicity of time window should be [2 times of DRX cycle] in RRC\_INACTIVE.
  + Option 2: (Huawei)
    - RAN4 to define the tests for CPP with periodic time window
      * Periodicity and offset: 2 times of PRS resource periodicity
      * Offset: same as PRS resource offset
      * Duration: covering all PRS resources from all TRPs
* Recommended WF
  + Discuss the option(s).

Discussion:

Agreement:

Time window configuration in CPP TCs:

* Offset: same as PRS resource offset
* Duration: covering all PRS resources from all TRPs
* For RRC\_CONNECTED: Periodicity: 2 times of PRS resource periodicity
* For RRC\_INACTIVE: The periodicity of time window should be 2 times of LCM(DRX cycle, PRS periodicity)
  + Note: In the legacy configuration PRS periodicity is always smaller than DRX periodicity

### Issue 2-2-2: Additional margins for frequency drift and RF calibration

|  |
| --- |
| Issue 4-1-2: DL RSCPD absolute accuracy requirements *Agreements in RAN4#110bis:*   * Accuracy requirements for DL RSCPD and relative DL RSCP are defined using the same PRB numbers as used in existing RSTD and UE Rx-Tx accuracy requirements. * FFS: On top of simulated CPP measurement results, additional margins for frequency drift and RF calibration should be considered when defining RSCPD and relative RSCP accuracy requirements. * FFS: whether simulation assumptions need to be updated. |

* Proposals
  + Option 1a: (OPPO)
    - On top of simulated CPP measurement results, additional margins for frequency drift and RF calibration should be considered when defining RSCPD and relative RSCP accuracy requirements.
  + Option 1b: (Qualcomm, Huawei)
    - RAN4 to add margin to the RSCPD accuracy derived from RAN4 simulations to account for residual frequency errors.
  + Option 2: (Ericsson)
    - RAN4 to avoid defining separate margins for the measurements that are performed together by the UE.
    - Do not update simulation assumptions for carrier phase measurement.
* Recommended WF
  + Discuss the option(s).

Discussion:

* Option 1: Define extra margin in requirements
  + FFS: need for extra simulations.
* Option 2: Do not define extra margin in requirements
  + Do not update simulation assumptions for carrier phase measurement.

No consensus. Further discuss in the next meeting, proponents are requested to bring results justifying the additional margin for Option 1.

# Topic #6: performance [111][214] NR\_pos\_enh2\_part3

## LPHAP (Agenda 7.12.2.3)

Issues recommended for discussion by moderator:

Issue 1-2-1: eDRX related configuration

Issue 1-2-2: whether to configure PRS measurement reporting periodicity

Issue 1-2-3: configurations for cell reselection TCs

Issues prioritized during the AH: 1-2-1, 1-2-2, 1-2-3.

### Issue 1-2-2: whether to configure PRS measurement reporting periodicity

* Proposals
  + Option 1 (HW):
    - No
  + Option 2 (E///):
    - Yes, configured as 20s (smaller than eDRX cycle)
* Recommended WF
  + Discuss the options.

Discussion:

Further discussion is needed.

### Issue 1-2-1: eDRX related configuration

* Proposals
  + Option 1 (HW):
    - eDRX cycle for both RAN and CN: 655.36s (640 HFs)
    - PTW length: 10.24s
    - DRX cycle: same as in existing TCs
  + Option 2 (OPPO, QC, vivo):
    - eDRX cycle for both RAN and CN: 20.48s
    - PTW length: 1.28s
    - DRX cycle: same as in existing TCs
  + Option 3 (E///):
    - eDRX cycle: 40.96s
    - PTW length: N/A
    - DRX cycle: N/A
* Recommended WF
  + Agree to use same eDRX cycle and PTW length for CN eDRX and RAN eDRX.
  + Agree to use same DRX cycle as in respective R17 TCs.
  + Discuss the options for exact values for eDRX cycle and PTW length.

Check for agreement:

* Agree to use same eDRX cycle and PTW length for CN eDRX and RAN eDRX.
* Agree to use same DRX cycle as in respective R17 TCs.
* Exact values for eDRX cycle and PTW length: …

Discussion:

Agreement:

* In TC configuration, agree to use same eDRX cycle and PTW length for CN eDRX and RAN eDRX.
* Reuse DRX cycle configuration from corresponding R17 TCs.
* eDRX cycle length: longer than reporting periodicity.
  + eDRX cycle length configuration: 4 x 10.24 s

### Issue 1-2-3: configurations for cell reselection TCs

* Proposals
  + Option 1 (HW)
    - UE is configured with 5.12s SRS periodicity in Cell 1
    - UE is not configured with PRS measurement
    - simplify existing cell reselection TCs by using only two time periods
* Recommended WF
  + Discuss the options.

Check:

* FFS: simplify existing cell reselection TCs by using only two time periods
* UE is configured with 5.12s SRS periodicity in Cell 1
* UE is not configured with PRS measurement

Discussion:

Agreement:

* UE is not configured with PRS measurement
* UE is configured with 5.12s SRS periodicity in Cell 1
* Simplify existing cell reselection TCs by using only two time periods
  + Time period (T3) for reselection back is not needed

1. Topic #7: Core draft CRs for all threads

## General (AI 7.12.1.1)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Old TDoc** | **Title** | **Source** | **Comments** | **Recommendation/decision** |
| [**R4-2409368**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409368.zip) | Draft Big CR to 38.133 on RRM core requirements for Positioning Enhancements | Ericsson |  | Revised draft CR or a new tdoc for agreement? |

## RedCap positioning (AI 7.12.1.4)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Old TDoc** | **Title** | **Source** | **Comments** | **Recommendation/decision** |
| [**R4-2407789**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407789.zip) | (NR\_Pos\_enh2-Core) 38.133 CR addressing the use of expected to in normative text | BeammWave, Nokia | Change is not consistent with the description in the cover sheet. Similar changes under other WIs. | Revised to: R4-240xxxx |
| [**R4-2407833**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407833.zip) | draftCR for RedCap postioing requirements in RRC\_Idle | Xiaomi | Review comments in the CR. The removed text is not duplicate. Some changes are not correct. Comments should be removed. | Noted |
| [**R4-2409267**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409267.zip) | draftCR on RRM requirements for RedCap positioning | Huawei, HiSilicon | Cover sheet and comments received from other companies. | Revised to: R4-240xxxx |
| [**R4-2409585**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409585.zip) | DraftCR to 38.133 on core requirements for RedCap positioning | Ericsson | Include changes to 5.6A.4.5/5.5 from R4-2409265. | Revised to: R4-240xxxx |

## PRS/SRS bandwidth aggregation (AI 7.12.1.4)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Old TDoc** | **Title** | **Source** | **Comments** | **Recommendation/decision** |
| [**R4-2409268**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409268.zip) | draftCR on RRM requirements for PRS CA | Huawei, HiSilicon | Date wrong in the coversheet – correct. | Revised to: R4-240xxxx |
| [**R4-2409584**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409584.zip) | DraftCR to 38.133 on core requirements for bandwidth aggregation for positioning measurements | Ericsson |  | Can be endorsed? |

## SL positioning (AI 7.12.1.2)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Old TDoc** | **Title** | **Source** | **Comments** | **Recommendation/decision** |
| [**R4-2409263**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409263.zip) | draftCR on RRM requirements for SL positioning | Huawei, HiSilicon | Why we don’t have this in legacy? Depends on new agreements | Return to |
| [**R4-2409370**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409370.zip) | Draft CR to 38.133 on SL positioning RRM core requirements | Ericsson |  | Revised to: R4-240xxxx |

## Carrier Phase positioning (AI 7.12.1.2)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Old TDoc** | **Title** | **Source** | **Comments** | **Recommendation/decision** |
| [**R4-2409264**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409264.zip) | draftCR on RRM requirements for CPP | Huawei, HiSilicon | Depends on the progress, revise or merge | ? |
| [**R4-2409581**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409581.zip) | DraftCR to 38.133 on core requirements for CPP | Ericsson | Depends on the progress, revise or merge | ? |

## LPHAP (AI 7.12.1.3)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Old TDoc** | **Title** | **Source** | **Comments** | **Recommendation/decision** |
| [**R4-2407972**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407972.zip) | Draft CR – Corrections to PRS measurement period with eDRX in RRC\_IDLE state | Qualcomm Incorporated | Changes to 4.5.2.5 to captured in revision of R4-2409582. Changes to 4.5.3.5/4.6.3.5 to be captured in revision of R4-2409265. Comments received from other companies. | Revised to: R4-240xxxx |
| [**R4-2409265**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409265.zip) | draftCR on RRM requirements for LPHAP | Huawei, HiSilicon | Changes to 5.6A.4.5/5.5 are captured in the revision of R4-2409585. Comments received from other companies. | Revised to: R4-240xxxx |
| [**R4-2409582**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409582.zip) | DraftCR to 38.133 on Core requirements for LPHAP | Ericsson | Capture changes to 4.5.2.5 and 5.6.2.5 from R4-2407972 and R4-2409265. | Revised to: R4-240xxxx |

1. Topic #8: Perf draft CRs for all threads

## General (AI 7.12.2.1)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Old TDoc** | **Title** | **Source** | **Comments** | **Recommendation/decision** |
| [**R4-2409270**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409270.zip) | draftCR on time window configuration | Huawei, HiSilicon | (CPP) “DL-PRS Measurement time window”, according to RAN2? Abbreviations in section 3? | Revised to: R4-240xxxx |
| [**R4-2409369**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409369.zip) | Draft Big CR to 38.133 on RRM performance requirements for Positioning | Ericsson |  | Revised to: R4-240xxxx |
| [**R4-2409587**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409587.zip) | DraftCR to 38.133 on general aspects related to performance requirement | Ericsson |  | Can be endorsed? |

## RedCap positioning (AI 7.12.2.4)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Old TDoc** | **Title** | **Source** | **Comments** | **Recommendation/decision** |
| [**R4-2407488**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407488.zip) | (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 | CATT |  | Revised to: R4-240xxxx |
| [**R4-2407882**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407882.zip) | [TC 3-29 and 3-30] Draft CR on TC for PRS-RSRPP delay with Rx FH in RRC CONNECTED | OPPO |  | Revised to: R4-240xxxx |
| [**R4-2408488**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2408488.zip) | (3-17~20) Test cases for RedCap RSTD measurement delay with frequency hopping | Intel Corporation |  | Revised to: R4-240xxxx |
| [**R4-2409277**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409277.zip) | draftCR on performance requirements for RedCap positioning | Huawei, HiSilicon |  | Revised to: R4-240xxxx |
| [**R4-2409590**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409590.zip) | DraftCR to 38.133 on performance requirements for Rel.18 RedCap positioning | Ericsson |  | Revised to: R4-240xxxx |
| [**R4-2409650**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409650.zip) | (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 | Nokia |  | Revised to: R4-240xxxx |
| [**R4-2409700**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409700.zip) | Draft CR for test case on RedCap positioning\_PRS RSRPP | ZTECorporation,Sanechips |  | Revised to: R4-240xxxx |
| [**R4-2409731**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409731.zip) | draftCR (3-1)(3-3)(4-1)(4-3) TCs for RedCap positioning without FH on RSTD measurement delay and accuracy in FR1 | MediaTek inc. |  | Revised to: R4-240xxxx |

## PRS/SRS bandwidth aggregation (AI 7.12.2.5)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Old TDoc** | **Title** | **Source** | **Comments** | **Recommendation/decision** |
| [**R4-2407489**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407489.zip) | (5-3, 4) Draft CR on RSTD measurement reporting delay test cases for PRS aggregation in FR1 and FR2 in RRC\_INACTIVE state | CATT | Should be same TRP | Return to |
| [**R4-2407884**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407884.zip) | [2-6] Draft CR on PRS-RSRP Measurements Based on PRS BWA | OPPO | Shouldn’t be “absolute measurement report mapping”? | Revised to: R4-240xxxx |
| [**R4-2407973**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407973.zip) | Draft CR – Test cases for UE Rx-Tx measurement delay with PRS BW aggregation, Sets 5-5, 5-6, 5-7, 5-8 | Qualcomm Incorporated |  | Revised to: R4-240xxxx |
| [**R4-2407974**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407974.zip) | Draft CR – Performance requirements for UE Rx-Tx measurements with PRS bandwidth aggregation (Set 2-7) | Qualcomm Incorporated |  | Revised to: R4-240xxxx |
| [**R4-2408295**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2408295.zip) | Draft CR on PRS-RSRPP measurements based on PRS aggregation - set 2-8 | vivo |  | Revised to: R4-240xxxx |
| [**R4-2409279**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409279.zip) | draftCR on performance requirements for PRS CA | Huawei, HiSilicon |  | Revised to: R4-240xxxx |
| [**R4-2409592**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409592.zip) | DraftCR to 38.133 to introduce test cases for PRS aggregation for positioning measurements | Ericsson |  | Revised to: R4-240xxxx |

## SL positioning (AI 7.12.2.2)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Old TDoc** | **Title** | **Source** | **Comments** | **Recommendation/decision** |
| [**R4-2407519**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407519.zip) | (Set 1-4 & 10-2) Draft CR for SL PRS configuration and SL Rx-Tx measurement delay TC in FR1 | CATT | A.3.X, A.9A.1.1.X (UE RxTx delay TC) | Revised to: R4-240xxxx |
| [**R4-2407880**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407880.zip) | [2-14] Draft CR on Measurements Accuracy for SL PRS-RSRPP | OPPO | 10.4A.5.2  “or” should not be in italic, TBDs for accuracy, incorrect side conditions | Revised to: R4-240xxxx |
| [**R4-2408297**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2408297.zip) | Draft CR on measurement delay test cases for SL positioning - Sets 10-3 10-4 | Vivo | A.9A.1.1.3 (SL AoA delay), A.9A.1.1.4 (SL RTOA delay) | Revised to: R4-240xxxx |
| [**R4-2409272**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409272.zip) | draftCR on performance requirements for SL positioning | Huawei, HiSilicon | 10.4A.4.2 | Revised to: R4-240xxxx |
| [**R4-2409372**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409372.zip) | Draft CR to 38.133 on SL positioning RRM performance | Ericsson | Reference (accuracy and delay TC) | Revised to: R4-240xxxx |

## Carrier Phase positioning (AI 7.12.2.6)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Old TDoc** | **Title** | **Source** | **Comments** | **Recommendation/decision** |
| [**R4-2407520**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407520.zip) | (Set 7-3 & 7-4) Draft CR for RSCPD with RSTD measurement delay TC in RRC\_INACTIVE in FR1 and FR2 | CATT |  |  |
| [**R4-2407834**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407834.zip) | Draft CR – Test cases for UE Rx-Tx measurement delay with PRS BW aggregation, Sets 5-5, 5-6, 5-7, 5-8 | Xiaomi |  |  |
| [**R4-2409166**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409166.zip) | Sets (2-9), (7-5) and (7-6) DL CPP performance requirements and measurement delay TCs for RSCP with UE Rx-Tx in RRC\_CONNECTED for FR1 and FR2 | Nokia |  |  |
| [**R4-2409594**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409594.zip) | DraftCR to 38.133 to introduce measurement delay test case for RSCPD with RSTD measurement for NR positioning | Ericsson |  |  |

## LPHAP (AI 7.12.2.3)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Old TDoc** | **Title** | **Source** | **Comments** | **Recommendation/decision** |
| [**R4-2407881**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407881.zip) | [TC 9-5 and 9-6] Draft CR on PRS-RSRP delay TC for case 2 in FR1 | OPPO |  |  |
| [**R4-2407975**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407975.zip) | Draft CR – Test cases for UE Rx-Tx measurement delay with eDRX > 10.24s in RRC\_INACTIVE, Sets 9-11, 9-12 | Qualcomm Incorporated |  |  |
| [**R4-2408296**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2408296.zip) | Draft CR on measurement delay test cases for LPHAP - Sets 9-3 9-4 | vivo |  |  |
| [**R4-2409274**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409274.zip) | draftCR on performance requirements for LPHAP | Huawei, HiSilicon |  |  |
| [**R4-2409588**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409588.zip) | DraftCR to 38.133 to introduce test cases for LPHAP in RRC\_INACTIVE state in FR1 | Ericsson |  |  |

# Topic #9: Other documents for approval, including updated work split

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **TDoc** | **Title** | **Source** | **Comments** | **Recommendation/decision** |
| [**R4-2409586**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409586.zip) | Updated work split on test cases for RedCap positioning | Ericsson | Issue 3-1-1 | Approved |
|  | WF on RedCap positioning and PRS/SRS bandwidth aggregation | Ericsson |  | New document: R4-240xxxx |
|  | WF on SL positioning and carrier phase positioning | CATT |  | New document: R4-240xxxx |
|  | WF on LPHAP | Huawei |  | New document: R4-240xxxx |
|  | Ad-hoc minutes #1 on RRM for NR\_pos\_enh2 | Ericsson |  | New document: R4-240xxxx |
|  | Ad-hoc minutes #2 on RRM for NR\_pos\_enh2 | Ericsson |  | New document: R4-240xxxx |
|  | Ad-hoc minutes #3 on RRM for NR\_pos\_enh2 | Intel |  | New document: R4-240xxxx |

# Annex: Remaining issues after ad hoc #1 which were not discussed in the meeting

## Core part

### RedCap positioning (Agenda 7.12.1.4)

All issues

### PRS/SRS bandwidth aggregation (Agenda 7.12.1.4)

All issues

### SL positioning (Agenda 7.12.1.2)

All issues

### Carrier phase positioning (Agenda 7.12.1.2)

All issues

### LPHAP (Agenda 7.12.1.3)

All issues

## Performance part

### RedCap positioning (Agenda 7.12.2.4)

### PRS/SRS bandwidth aggregation (Agenda 7.12.2.5)

### SL positioning (Agenda 7.12.2.2)

#### Issue 1-2-1: SINR side conditions

Previous agreements:

* *SL AoA and SL RTOA (for core requirements only):*
  + *-6 dB*
* Proposals

For SL RSTD,

* + Option 1: (CATT, vivo)
    - (-3, -6) dB for reference UE and target UE respectively.
  + Option 2: (OPPO, Ericsson)
    - (0, -6) dB for reference UE and target UE respectively.
  + Option 3: (Qualcomm, Huawei)
    - (0, -3) dB for reference UE and target UE respectively.

For SL UE Rx-Tx, SL RSRP(P),

* + Option 1: (CATT, OPPO, vivo, Ericsson)
    - -6 dB
  + Option 2: (Qualcomm)
    - Define two side conditions: 0 dB and -3 dB
  + Option 3: (Huawei)
    - -3 dB for the target UE
* Recommended WF
  + Discuss the option(s).

Discussion:

#### Issue 1-2-2: Margin for RF calibration

* Proposals
  + Option 1: (OPPO)
    - The existing margins due to frequency drift and RF calibration for DL PRS can be reused for SL PRS.
    - Consider time margins due to frequency drift to Rx-Tx time difference accuracy requirement if the UE reports the transmission timestamp of a SL PRS, and the time margins for RSTD could be reused.
  + Option 2a: (Qualcomm)
    - Define the RF calibration margin for SL RSTD measurements in FR1 using the following structure:

|  |  |  |  |
| --- | --- | --- | --- |
| PRS BW (RB number) | | | Margin (Tc) |
| SCS=15kHz | SCS=30kHz | SCS=60kHz |
| ≥ 48 | ≥ 24 | N/A | Z1 |
| ≥ 96 | ≥ 48 | ≥ 24 | Z2 |
| N/A | ≥ 96 | N/A | Z3 |

* + - Define the RF calibration margin for SL Rx-Tx measurements in FR1 using the following structure:

|  |  |  |  |
| --- | --- | --- | --- |
| Min(SL PRS Rx BW, SL SRS Tx BW) (RB) | | | Margin (Tc) |
| SCS = 15 kHz | SCS = 30 kHz | SCS = 60 kHz |
| ≥ 48 | ≥ 24 | N/A | δ1 |
| ≥ 96 | ≥ 48 | ≥ 24 | δ2 |
| N/A | ≥ 96 | N/A | δ3 |

* + Option 2b: (vivo, Huawei)
    - Define the RF calibration margin for SL RSTD measurements in FR1 using the following structure:

|  |  |  |  |
| --- | --- | --- | --- |
| *PRS BW (RB number)* | | | *Margin (Tc)* |
| *SCS=15kHz* | *SCS=30kHz* | *SCS=60kHz* |
| ***≥ 48*** | ***≥ 24*** | ***N/A*** | ***Z1*** |
| ***≥ 96*** | ***≥ 48*** | ***≥ 24*** | ***Z2*** |

* + - Define the RF calibration margin for SL Rx-Tx measurements in FR1 using the following structure:

|  |  |  |  |
| --- | --- | --- | --- |
| *Min(SL PRS Rx BW, SL SRS Tx BW) (RB)* | | | *Margin (Tc)* |
| *SCS = 15 kHz* | *SCS = 30 kHz* | *SCS = 60 kHz* |
| ***≥ 48*** | ***≥ 24*** | ***N/A*** | ***δ1*** |
| ***≥ 96*** | ***≥ 48*** | ***≥ 24*** | ***δ2*** |

* Recommended WF
  + Discuss the option(s) with Option 2b as the starting point.

Discussion:

#### Issue 1-2-5: Measurement accuracy requirements

|  |
| --- |
| *Agreements in RAN4#110bis:*  **Issue 3-1-3: Assumptions to define SL PRS measurement accuracy requirements**  *Agreements:*   * Define measurement accuracy requirements for SL-PRS based RSTD, SL-PRS based UE Rx-Tx time difference, SL-PRS based RSRP and SL-PRS based RSRPP:   + independent of SL-PRS comb size,   + for same channel profiles as defined for Uu   + for measurement samples 1 or 4 depending on the RB number of PRS BW   **Issue 3-1-4: Measurement accuracy requirements**  *Agreements:*   * RAN4 to define accuracy requirement for SL RSTD and SL Rx-Tx by considering the framework of ±(X+Y[+Z]) Tc and ±(X[+δ]) Tc, respectively.   + X is the simulated measurement accuracy for a given propagation condition and number of measurement samples,   + Y is the frequency/clock drift margin,   + FFS: Z and δ are the RF calibration margins. |

* Proposals
  + Option 1: (Qualcomm)
    - Define SL position measurement accuracy using the following structure, aligned with the simulation assumptions.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Accuracy (Tc)** | **SL PRS Ês/Iot (dB)** | **SL PRS SCS (kHz)** | **SL PRS bandwidth (num RB)** | **Nsample** |
|
| [TBD] | (Ês/Iot)ref ≥TBD  (Ês/Iot)i ≥TBD | 15 | ≥ 48 | [1] |
| ≥ 96 | 1 |
| [TBD] | 30 | ≥ 24 | 4 |
| ≥ 48 | [1] |
| ≥ 96 | 1 |
| [TBD] | 60 | ≥ 24 | 4 |

* + - At least for AWGN, define one set of measurement accuracy requirements applicable to fully staggered and partially staggered (half comb) SL PRS.
    - For measurement accuracy requirements with multiple samples (Nsample = 4), do not assume coherent combining between samples.
  + Option 2: (Qualcomm, vivo)
    - RAN4 to define accuracy requirement for SL RSTD and SL Rx-Tx by considering the framework of ±(X+Y+Z) Tc and ±(X+**δ**) Tc, respectively.
  + Option 3a: (vivo)
    - Define measurement accuracy requirements based on the following RB number configuration
      * 15kHz SCS: 48, 96
      * 30kHz SCS: 24, 48,
      * 60kHz SCS: 24
  + Option 3b: (Huawei)
    - Accuracy requirements for SL PRS measurements are defined based on BW of
      * 15kHz SCS: 48 RB≤BW< 96 RBs, 96 RB≤BW
      * 30kHz SCS: 24 RB≤BW< 48 RBs, 48 RB≤BW<96 RBs
      * 60kHz SCS: 24 RB≤BW
  + Option 4: (Ericsson)
    - Two sets of accuracy requirements are to be defined for SL positioning measurements, i.e., for:
      * 1 sample (>48 PRBs), and
      * 4 samples (≤48 PRBs)
    - The measurement accuracy requirements can be specified in the following format:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | Conditions | | | | | | |
| SL-PRS Ês/Iot | SL-PRS SCS | SL-PRS bandwidth  Note 1 | Number of samples, S | Io Note 2 range | | |
| NR operating band groups Note 3 | Minimum Io | Maximum Io |
| Tc Note 4 | dB | kHz | RB |  |  | dBm/SCS | dBm/BWChannel |
| TBD | (SL-PRS Ês/Iot)ref ≥  0 dB  (SL-PRS Ês/Iot)*i* ≥  -6 dB | 15 | ≥ 24 | ≥ 4 | NR\_TDD\_FR1\_B | -126.5 | -50 |
| NR\_TDD\_FR1\_J | -122.5 | -50 |
| TBD | >48 | ≥ 1 | Note 5 | Note 5 | Note 5 |
| TBD  TBD | 30 | ≥ 24 | ≥ 4 | NR\_TDD\_FR1\_B | -123.5 | -50 |
| NR\_TDD\_FR1\_J | -119.5 | -50 |
| TBD | >48 | ≥ 1 | Note 5 | Note 5 | Note 5 |
| TBD | 60 | ≥ 24 | ≥ 4 | NR\_TDD\_FR1\_B | -120.5 | -50 |
| NR\_TDD\_FR1\_J | -116.5 | -50 |
| TBD | >48 | ≥ 1 | Note 5 | Note 5 | Note 5 |
| NOTE 1: Minimum SL-PRS bandwidth, which is the minimum of the SL-PRS bandwidths of the reference resource and the measured neighbour resource i.  NOTE 2: Io is assumed to have constant EPRE across the bandwidth.  NOTE 3: NR operating band groups in FR1 are as defined in clause 3.5.2.  NOTE 4: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 5: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the SL-PRS bandwidth of the smallest PRB number for the corresponding SCS. | | | | | | | |

* Recommended WF
  + Depends on the discussion of other issues.
  + Discuss the options using Option1 as the starting point:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Accuracy (Tc)** | **SL PRS Ês/Iot (dB)** | **SL PRS SCS (kHz)** | **SL PRS bandwidth (num RB)** | **Nsample** |
|
| [TBD] | (Ês/Iot)ref ≥TBD  (Ês/Iot)i ≥TBD | 15 | ≥ 48 | [1] |
| ≥ 96 | 1 |
| [TBD] | 30 | ≥ 24 | 4 |
| ≥ 48 | [1] |
| ≥ 96 | 1 |
| [TBD] | 60 | ≥ 24 | 4 |

Check for agreement:

Requirements are to be defined for 1 and 4 samples, depending on BW.

The accuracy requirements for 4 samples allow for non-coherent combining.

Accuracy requirements to cover all supported BWs.

Discussion:

#### Issue 1-2-6: Test case configurations

|  |
| --- |
| Issue 3-1-7: Test configurations *Agreements in RAN4#110bis:*   * Define SL positioning test cases using only AWGN and 2-tap channel (for SL PRS RSRPP) propagation conditions. * RAN4 to define the test cases for dedicated resource pool and shared resource pool as test configurations, and the SL PRS configurations could apply to both types of resource pool. |

* Proposals
  + Option 1: (Qualcomm)
    - Define SL positioning test cases for a single carrier and single resource pool.
    - Do not define SL positioning test cases with additional path reporting.
    - Do not define SL positioning test cases with LoS/NLoS reporting.
    - Do not define SL positioning test cases with Tx/Rx ARP-ID reporting.
    - Define SL PRS configurations for SL positioning test cases that apply to both shared and dedicated resource pools
      * No TDM of SL PRS from different UEs in the same slot
      * No comb-based multiplexing of SL PRS from different UEs in the same slot
      * No FDM of SL PRS from different UEs in the same slot
  + Option 2: (vivo)
    - Consider the following configurations for test:

|  |  |
| --- | --- |
| **SCS and BW** | **Config 1: 15 kHz SCS 48 RBs 10MHz** |
| **Config 2: 15 kHz SCS 96 RBs 20MHz** |
| **Config 3: 30 kHz SCS 48 RBs 20MHz** |
| **Coverage** | **In coverage** |
| **Synchronization source** | **gNB** |
| **SINR for test** | **For UE 1, 3dB, for other UEs, -6dB** |

* + Option 3: (Huawei)
    - Shared and dedicated resource pools are randomly used among different TCs
    - All TX and RX UEs are in coverage and using gNB as sync reference
    - Es/Iot: 3dB (to ensure 100% PSCCH decoding)
    - RAN4 to consider the following SL PRS related parameters for the test.
      * (symbol num, comb size): (4, 4) and (2, 4)
      * BW: 48 RB for delay TCs, 24 and 48 RB for accuracy TCs
      * MUX of multiple TX UEs: TX UE1: slot n, TX UE2: slot n + 1 and slot n + 100ms
  + Option 4: (Ericsson)
    - SL positioning test cases are defined for 3 general NR Uu configurations:

|  |  |
| --- | --- |
| NR Uu configuration | Description |
| 1 | NR Uu: 15 kHz SSB SCS, 20 MHz bandwidth, FDD duplex mode |
| 2 | NR Uu: 15 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 3 | NR Uu: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

* + - SL positioning test cases are defined for 3 general NR SL configurations:

|  |  |
| --- | --- |
| NR SL configuration | Description |
| 1 | SL: 15 kHz, 10 MHz bandwidth, TDD duplex mode |
| 2 | SL: 30 kHz, 10 MHz bandwidth, TDD duplex mode |
| 3 | SL: 30 kHz, 20 MHz bandwidth, TDD duplex mode |

* + - The number of SL UEs in the measurement delay test cases for SL positioning is 4:
      * 1 target UE,
      * 3 anchor UEs (1 reference anchor UE and 2 other anchor UEs).
    - The number of SL UEs in the measurement accuracy test cases for SL positioning is 3:
      * 1 target UE,
      * 2 anchor UEs (1 reference anchor UE and 1 other anchor UE).
    - For each SL positioning measurement type, measurement delay test cases are defined for both numbers of samples (can be in the same section):
      * 1 sample, and
      * 4 samples.
    - For each SL positioning measurement type (for which accuracy requirements are defined), measurement accuracy test cases are defined for both numbers of samples (can be in the same section):
      * 1 sample, and
      * 4 samples.
* Recommended WF
  + Discuss the options considering the following aspects:
    - NR Uu configurations.
    - SL PRS configurations.
    - Parameters for test configurations, e.g., SCS and BW.
    - Whether all TX and RX UEs are in coverage and using gNB as sync reference.
    - Es/Iot.
    - The number of SL UEs in test cases.

Check for agreement:

* RAN4 will not specify SL positioning test cases with additional path reporting
* RAN4 will not specify SL positioning test cases with LoS/NLoS reporting (no corresponding RAN4 requirements to test)
* RAN4 will not specify SL positioning test cases with Tx/Rx ARP-ID reporting (no corresponding RAN4 requirements to test)
* The number of SL UEs in test cases
  + The number of SL UEs in the SL measurement delay test cases for SL positioning:
    - SL RSTD: **3** (1 target rx UE, 3 anchor tx UEs [1 reference anchor UE and 2 other anchor UEs)])
    - SL Rx-Tx, SL PRS-RSRP/RSRPP, SL AoA: **2** (1 target rx UE, 2 anchor tx UEs),
    - SL RTOA: **2** (1 target tx UE, 1 anchor rx UE, 1 other target tx UE).
  + The number of SL UEs in the SL measurement accuracy test cases for SL positioning:
    - SL RSTD, SL Rx-Tx, SL PRS-RSRP/RSRPP, SL AoA: **3** (1 target rx UE, 2 anchor tx UEs [1 reference anchor UE and 1 other anchor UE]),
    - SL RTOA: **2** (1 target tx UE, 1 anchor rx UEs, 1 other target tx UE).
* NR Uu configurations

|  |  |
| --- | --- |
| NR Uu configuration | Description |
| 1 | NR Uu: 15 kHz SSB SCS, 20 MHz bandwidth, FDD duplex mode |
| 2 | NR Uu: 15 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 3 | NR Uu: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

* SL PRS configurations

|  |  |
| --- | --- |
| NR SL configuration | Description |
| 1 | SL: 15 kHz, 10 MHz bandwidth, TDD duplex mode |
| 2 | SL: 30 kHz, 10 MHz bandwidth, TDD duplex mode |
| 3 | SL: 30 kHz, 20 MHz bandwidth, TDD duplex mode |

* All TX and RX UEs are in coverage and using gNB as sync reference
* Parameters for test configurations, e.g., SCS and BW (depends on the previous issues)
* Es/Iot.

Discussion:

#### Issue 1-2-4: Value of Nsample for 48 PRB SL-PRS BW

|  |
| --- |
| *Agreements in RAN4#110:*   * Update the definition of Nsample as the following:   + = 1 for SL-PRS BW > 48 PRBs,   + = 4 for SL-PRS BW ≤ 48 PRBs   + FFS whether for 48 PRBs SL-PRS BW a lower number of samples can be used based on performance results. |

* Proposals
  + Option 1: (Huawei)
    - Use Nsample = 1 for SL-PRS BW = 48 PRB.
* Recommended WF
  + Discuss the option(s).

Discussion:

#### Issue 1-2-3: Time margin for Rx-Tx time difference measurements when UE reports the transmission timestamp of a SL PRS

* Proposals
  + Option 1: (OPPO)
    - Consider time margins due to frequency drift to Rx-Tx time difference accuracy requirement if the UE reports the transmission timestamp of a SL PRS, and the time margins for RSTD could be reused.
* Recommended WF
  + Discuss the option(s).

Discussion:

### Carrier phase positioning (Agenda 7.12.2.6)

### LPHAP (Agenda 7.12.2.3)