3GPP TSG-RAN WG4 Meeting #112 R4-24xxxxx

Maastricht, Netherlands, August 19th – 23rd, 2024

**Agenda item:** 6.1.3

**Source:** Ad-hoc chair (Intel Corporation)

**Title:** Ad-hoc minutes for NR positioning AH3 (Tuesday)

**Document for:** Approval

# Introduction

This document is the ad-hoc minutes for Rel-18 NR Positioning with the following threads covered.

|  |  |  |  |
| --- | --- | --- | --- |
| Email title | Topic areas | AI covered in the topic thread | Summary document |
| [112][210] NR\_pos\_enh2\_part1 | RRM core maintenance and performance requirements - General- RedCap positioning- PRS/SRS BW aggregation | 6.1.1.1 (relevant tdocs)6.1.1.46.1.2.1 (relevant tdocs)6.1.2.46.1.2.5 | R4-2411805 |
| [112][211] NR\_pos\_enh2\_part2 | RRM core maintenance and performance requirements- SL Positioning- Carrier Phase Positioning | 6.1.1.1 (relevant tdocs)6.1.1.26.1.2.1 (relevant tdocs)6.1.2.26.1.2.6 | R4-2411806 |
| [112][212] NR\_pos\_enh2\_part3 | RRM core maintenance and performance requirements- LPHAP use case | 6.1.1.1 (relevant tdocs)6.1.1.36.1.2.1 (relevant tdocs)6.1.2.3 | R4-2411807 |

The recommendations after AH#2 is:

* Continue:
	+ SL positioning core (was not discussed) in Topic #5
	+ Topic #7 (not all CRs were discussed)
* Come back to:
	+ Topic #4,
	+ CPP core issue 2-1-1 in Topic #5
* On-line discussion needed in RAN4 RRM room:
	+ CPP performance issue 2-2-2 and CPP core issue 2-1-3 (same issue)

The following topics are covered in this AH

* Core part requirements maintenance
	+ SL positioning
	+ RedCap positioning
	+ PRS/SRS bandwidth aggregation
	+ Carrier phase positioning (not treated in AH)
1. Core requirements maintenance

## SL Positioning Core Requirements (AI 6.1.1.2 / [112][211] NR\_pos\_enh2\_part2)

### **Issue 1-1-1: End point of SL-PRS based RSTD measurement period requirements**

|  |
| --- |
| *Agreements in RAN4#110bis:** The SL RSTD measurement period ends after the UE has measured SL PRS resources from at least two different Tx UEs including target and reference UEs.
* FFS whether any updates to the TS 38.133 are needed.
 |

* Proposals
	+ Option 1: (Huawei)
		- Update the SL RSTD requirements to reflect that measurement period ends after the UE has measured SL PRS resources from at least two different Tx UEs.
* Discussion
	+ E///: specification already includes this and no further updates are needed. RSTD is mostly driven by target link measurements.
	+ HW: previous requirements may limit UE implementation
* Summary
	+ No common understanding on RAN2 procedure for reporting behavior. Companies will check offline.
	+ No consensus at the moment to revisit previous agreement

### **Issue 1-1-2: Impact of Uu link connect**

* Proposals
	+ Option 1: (Huawei)
		- RAN4 not to define any impact of Uu link connection on the measurement period.
* Discussion
	+ E///: The issue was resolved in the last meeting, by adding Note 3 in the introduction part of SL positioning section.
	+ Nokia: prefer not to specify this aspect
	+ QC: can compromise to keep the Note 3
* Conclusion
	+ The issue is resolved already by adding Note 3 in the introduction part of SL positioning section in the latest version of specification

### **Issue 1-1-3: Measurement period requirements for SL PRS-RSRP(P)**

* Proposals
	+ Option 1: (Huawei)
		- Remove dedicated measurement period requirements for SL PRS-RSRP(P).
	+ Option 2: (Ericsson)
		- Update the measurement period definition of SL PRS-RSRP and SL PRS-RSRPP to refer to SL RSTD, SL Rx-Tx, SL AoA, and SL RTOA, depending on which of them the SL PRS-RSRP and SL PRS-RSRPP measurements are configured.
* Discussion
	+ E///: The difference is whether to keep or remove the section.
* Agreements
	+ Update the measurement period definition of SL PRS-RSRP and SL PRS-RSRPP to refer to SL RSTD, SL Rx-Tx, SL AoA, and SL RTOA, depending on which of them the SL PRS-RSRP and SL PRS-RSRPP measurements are configured.

## RedCap positioning (AI 6.1.1.4 / [112][210] NR\_pos\_enh2\_part1)

### **Issue 2-1: Requirement on N\_(hops,effect)for RedCap positioning core requirements**

* Proposals
	+ Option 1: HW
		- Update the requirement on as

where

* + - * is the index of hops within an MG instance
			* is the number of unmuted PRS repetitions that overlaps with the sampling window of hop ,
			* if = 2, otherwise .
* **Discussion in AH2:**

Postpone the issue, come back.

Further off-line discussion is needed.

* **Discussion in AH3**
* Tentative agreement
	+ the parameter shall take into account the number of unmuted inter-slot PRS repetitions that overlap with the sampling window within each hop

### **Issue 2-2: Requirement on N\_hop for RedCap positioning core requirements**

* Proposals
	+ Option 1: HW
		- Update the requirements on by adding an upper bound for N3 capability
			* .
* **Discussion in AH2:**
	+ Postpone the issue, come back.
	+ Further off-line discussion is needed.
* **Discussion in AH3**
	+ HW: N3 reflects UE buffering capability
* **Agreements**
	+ Update the requirements on by adding an upper bound for N3 capability

.

### **Issue 2-3: Requirement on L\_prs for RedCap positioning core requirements**

* Proposals
	+ Option 1: HW
		- Update the requirements on by considering measurement of different PRS resources in different MG occasions
			* .
* Discussion in AH2:
	+ Qualcomm: Further discussion is needed, the proposal is not complete.
	+ Postpone the issue, come back.
* Discussion
	+ HW: J is the number of gap occasions during Tavailable
* Tentative agreements
	+ Update the requirements on by considering measurement of different PRS resources in different MG occasions
		- .
		- Where J is the number of measurement gap occasions during *Tavailable\_PRS,i*

## PRS/SRS bandwidth aggregation (AI 6.1.1.4)

### **Issue 3-1: Considerations for interruption length for SRS aggregation for positioning**

* Proposals
	+ Option 1: CATT
		- Interruption length is derived by: guard period + SRS transmission + guard period.
	+ Option 2: HW
		- For interruption requirements for SRS BWA on CC without PUCCH/PUSCH,
			* SRS is transmitted only if SRS duration plus guard period before and after does not collide with other UL transmission or DL reception with higher priority as defined by RAN1 on victim cells
			* SRS is transmitted only if SRS duration plus guard period before and after does not collide with any NR L3 or L1 measurement on victim cells
			* The victim cells are given by 41-4-9
			* The interruption length is defined on symbol level as 2\*guard period + SRS duration, where the guard period is indicated via component 9 of 41-4-7
* Discussion in AH2:
	+ Postpone the issue, come back.
	+ Further off-line discussion is needed.
* Discussion
	+ Nokia: SRS transmission is unclear
	+ CATT: we agreed to use SRS carrier switching. SRS transmission is 6 OFDM symbols
* Tentative agreements
	+ The interruption length is derived by: guard period + duration of aggregated SRS transmission + guard period.
	+ SRS is transmitted only if SRS duration plus guard period before and after does not collide with other UL transmission or DL reception with higher priority as defined by RAN1 on victim cells
	+ SRS is transmitted only if SRS duration plus guard period before and after does not collide with any NR L3 or L1 measurement on victim cells
	+ The victim cells/carriers can be derived by UE capability 41-4-9
	+ The interruption length is defined on a symbol level

### **~~Issue 3-2: Values of interruption length~~**

* ~~Proposals~~
	+ ~~Option 1: CATT~~
		- ~~The interruption lengths for SRS aggregation with aggressor cell(s) in FR1 are defined as.~~

~~Table 1: Interruption length X1 (slot)~~

|  |  |  |  |
| --- | --- | --- | --- |
|  | ~~NR Slot length~~ ~~(ms) of victim cell~~ | ~~Guard period~~ ~~(us) Note 1~~ | ~~Interruption length X1 (slots)~~ |
| ~~SCS for aggressor cell (kHz)~~ |
| ~~15~~ | ~~30~~ |
| ~~0~~ | ~~1~~ | ~~≤ 200~~ | ~~1~~ | ~~1~~ |
| ~~1~~ | ~~0.5~~ | ~~0, 30~~ | ~~1~~ | ~~1~~ |
| ~~100, 140~~ | ~~2~~ | ~~1~~ |
| ~~200~~ | ~~2~~ | ~~2~~ |
| ~~2~~ | ~~0.25~~ | ~~0~~ | ~~2~~ | ~~1~~ |
| ~~30~~ | ~~2~~ | ~~2~~ |
| ~~100, 140~~ | ~~3~~ | ~~2~~ |
| ~~200~~ | ~~4~~ | ~~3~~ |
| ~~3~~ | ~~0.125~~ | ~~0~~ | ~~4~~ | ~~2~~ |
| ~~30~~ | ~~4~~ | ~~3~~ |
| ~~100~~ | ~~5~~ | ~~4~~ |
| ~~140~~ | ~~6~~ | ~~4~~ |
| ~~200~~ | ~~7~~ | ~~5~~ |
| ~~5~~ | ~~0.03125~~ | ~~0~~ | ~~13~~ | ~~7~~ |
| ~~30~~ | ~~15~~ | ~~9~~ |
| ~~100~~ | ~~20~~ | ~~13~~ |
| ~~140~~ | ~~22~~ | ~~16~~ |
| ~~200~~ | ~~26~~ | ~~20~~ |
| ~~6~~ | ~~0.015625~~ | ~~0~~ | ~~26~~ | ~~13~~ |
| ~~30~~ | ~~30~~ | ~~17~~ |
| ~~100~~ | ~~39~~ | ~~26~~ |
| ~~140~~ | ~~44~~ | ~~31~~ |
| ~~200~~ | ~~52~~ | ~~39~~ |
| ~~Note1: Guard period is UE capability indicated by~~ *~~guardPeriod~~* ~~in~~ *~~NR-UL-SRS-Capability~~*~~.~~ |

* + - ~~The interruption lengths for SRS aggregation with aggressor cell(s) in FR2are defined as.~~

~~Table 2: Interruption length X2 (slot).~~

|  |  |  |  |
| --- | --- | --- | --- |
|  | ~~NR Slot length~~ ~~(ms) of victim cell~~ | ~~Guard period~~ ~~(us)~~ ~~Note 1~~ | ~~Interruption length X2 (slots)~~ |
| ~~SCS for aggressor cell (kHz)~~ |
| ~~60~~ | ~~120~~ | ~~480, 960~~ |
| ~~0~~ | ~~1~~ | ~~≤ 200~~ | ~~1~~ | ~~1~~ | ~~1~~ |
| ~~1~~ | ~~0.5~~ | ~~≤ 140~~ | ~~1~~ | ~~1~~ | ~~1~~ |
| ~~200~~ | ~~2~~ | ~~1~~ | ~~1~~ |
| ~~2~~ | ~~0.25~~ | ~~0~~ | ~~1~~ | ~~1~~ | ~~1~~ |
| ~~30~~ | ~~1~~ | ~~1~~ | ~~1~~ |
| ~~100~~ | ~~2~~ | ~~1~~ | ~~1~~ |
| ~~140~~ | ~~2~~ | ~~2~~ | ~~2~~ |
| ~~200~~ | ~~3~~ | ~~2~~ | ~~2~~ |
| ~~3~~ | ~~0.125~~ | ~~0~~ | ~~1~~ | ~~1~~ | ~~1~~ |
| ~~30~~ | ~~2~~ | ~~1~~ | ~~1~~ |
| ~~100~~ | ~~3~~ | ~~2~~ | ~~2~~ |
| ~~140~~ | ~~4~~ | ~~3~~ | ~~3~~ |
| ~~200~~ | ~~5~~ | ~~4~~ | ~~4~~ |
| ~~5~~ | ~~0.03125~~ | ~~0~~ | ~~4~~ | ~~2~~ | ~~1~~ |
| ~~30~~ | ~~6~~ | ~~4~~ | ~~3~~ |
| ~~100~~ | ~~10~~ | ~~8~~ | ~~7~~ |
| ~~140~~ | ~~13~~ | ~~11~~ | ~~10~~ |
| ~~200~~ | ~~17~~ | ~~15~~ | ~~14~~ |
| ~~6~~ | ~~0.015625~~ | ~~0~~ | ~~7~~ | ~~4~~ | ~~1~~ |
| ~~30~~ | ~~11~~ | ~~8~~ | ~~5~~ |
| ~~100~~ | ~~20~~ | ~~16~~ | ~~14~~ |
| ~~140~~ | ~~25~~ | ~~22~~ | ~~19~~ |
| ~~200~~ | ~~33~~ | ~~29~~ | ~~27~~ |
| ~~Note1: Guard period is UE capability indicated by~~ *~~guardPeriod~~* ~~in~~ *~~NR-UL-SRS-Capability~~*~~.~~ |

* + ~~Option 2: E///~~
		- ~~Interruption requirements for SRS transmission with BW aggregation on CC without PUSCH/PUCCH are defined based on the existing SRS carrier switching framework only.~~
		- ~~Interruption requirements are defined separately for UEs supporting guard period values {0µs, 30µs, 100µs} and UEs supporting guard period values {140µs, 200µs}.~~
* ~~Discussion in AH2:~~
	+ ~~Postpone the issue, come back.~~
	+ ~~Further off-line discussion is needed.~~
* ~~Discussion~~
* ~~Conclusion~~

### **Issue 3-3: Core requirement for RSTD measurement**

* Proposals
	+ Option 1: HW
		- In PRS BWA requirements for , replace the margin as .
* Discussion in AH2:
	+ Ericsson: the proposal is not aligned with the agreed signalling.
	+ Further off-line discussion is needed.
	+ Come back.
* Discussion in AH3:
	+ Come back

## Carrier phase positioning (AI 6.1.1.2 / [112][211] NR\_pos\_enh2\_part2)

### **Issue 2-1-1: Measurement period requirements for DL RSCP/DL RSCPD with aperiodic time window**

* Proposals
	+ Option 1a: (CATT)
		- When an aperiodic time window is configured, the measurement period requirements of CPP is upper-bounded by the duration of this time window.
	+ Option 1b: (Nokia)
		- RAN4 to specify measurement requirements for aperiodic time window, defined in the LPP spec, and to set the measurement period equal to the duration of the time window.
	+ Option 2: (Huawei)
		- When aperiodic time window is configured and UE support FG 41-2-3,
			* the measurement period for CPP is ,
			* the measurement period for RSTD/Rx-Tx is ,
			* is the time from the start of the measurement to the start of the time window,
			* is the processing time for PFL i,
			* is the legacy requirements for RSTD and Rx-Tx.
	+ Option 3: (Ericsson)
		- Aperiodic time window for CPP measurement is not supported and therefore no corresponding requirement for CPP measurement is defined.
* Discussion in AH2:
	+ HW: Aperiodic time window=one-short window in the above options.
	+ Further discussion is needed on the options.
	+ Come back.
* Discussion
* Agreements