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

**Maastricht, NL, 19 ‒ 23 August, 2024**

**Title:** WF on RedCap positioning and PRS/SRS bandwidth aggregation

**Agenda Item:** x.x.x

**Source: Ericsson**

**Document for:** Approval

# Introduction

In this document agreements reached in RAN4#112 on the following issues are captured:

* core requirement for RedCap positioning
* core requirement for PRS/SRS BW aggregation
* general performance requirement
* performance requirements for RedCap positioning
* performance requirements for PRS/SRS BW aggregation.

Issue numbers used in the document correspond to the issue number in the topic summary for [112][210] NR\_pos\_enh2\_part1 thread.

# Core requirements for RedCap positioning

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

**Proposals**:

* Option 1: the parameter $N\_{rep}^{PRS}$ shall take into account the number of unmuted inter-slot PRS repetitions that overlap with the sampling window within each hop
* Option 2: $N\_{hops,effect}$ shall take into account the number of unmuted inter-slot PRS repetitions that overlap with the sampling windows of the hopping pattern with $N\_{hops}^{slot}$ hops per slot, within a single MG occasion, excluding the gap retuning times.
* Option 3: Other options are not precluded.

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

**Agreements**

* Update the requirements on $N\_{hop}$ by adding an upper bound for N3 capability

$N\_{hop}=min\left(N\_{hops,effect},\left⌊\frac{N3}{L\_{per−hop}}\right⌋,N\_{hop,max}\right)$.

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

**Agreements**

* Update the requirements on $L\_{prs}$ by considering measurement of different PRS resources in different MG occasions
	+ $L\_{available\\_PRS,i}= \sum\_{j=1}^{J}N\_{hop,i,j}∗L\_{per−hop,i,j}$.
	+ Where J is the number of measurement gap occasions during *Tavailable\_PRS,i*

# Core requirements for PRS/SRS BW aggregation

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

**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 3-3: Core requirements for PRS aggregation**

**Proposals**

* When UE is indicated by LMF in *nr-DL-PRS-JointMeasurementRequest-r18* to perform measurements by aggregating resources from multiple PFLs
	+ - Option 1: UE only measures resources indicated by LMF as linked resources.
			* Remove requirement on Tnon-aggregate from the existing core requirements for PRS aggregation.
		- Option 2: UE measures resources that are indicated by LMF as linked resources and resources that are not indicated by LMF as linked resources.

# General Performance requirement

### **Issue 4-1: Updated work split for Rel. 18 positioning**

**Agreement**:

* Updated work split for Rel. 18 positioning in [R4-2412683](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412683.zip) can be approved.

# Performance requirements for RedCap positioning

### **Issue 5-1: Additional BW configuration for RedCap positioning accuracy requirement with Rx FH**

**Agreement:**

* + RAN4 not to define FH accuracy requirements for additional BW configurations.
	+ RAN4 not to re-use non-FH accuracy requirements for FH cases.

### **Issue 5-2: Bandwidth configuration for accuracy requirement for RedCap positioning with Rx FH**

**Agreement**:

* Per-hop BW is defined in RB number instead of MHz.
* RAN4#111 agreement on per-hop BW and the total BW for RedCap positioning with Rx FH is revised and the accuracy requirements for Rx FH case are defined only for the following BW groups:
	+ 15 kHz: per-hop BW >= 52 RB, total BW = 268 RB
	+ 30 kHz: per-hop BW = 48 RB, total BW = 272 R
	+ 60 kHz (FR1): per-hop BW = 24 RB, total BW = 132 RB
	+ 60 kHz (FR2): per-hop BW >= 64 RB, total BW = 264 RB
	+ 120 kHz: per-hop BW = 64 RB, total BW = 264 RB

### **Issue 5-3: Group delay calibration margin for RedCap positioning**

**Agreement:**

* RAN4 to use the following assumptions for group delay calibration margin for RedCap
	+ Non-FH: existing values for non-RedCap for the applicable BW.
	+ FH: existing values for non-RedCap for per-hop BW [FFS: plus an extra margin (value TBD)].

### **Issue 5-4: PRS RMC for RedCap positioning TCs**

**Agreement:**

* [For PRS BW for FH TCs, consider the BW in test configuration as UE BW and allow cell BW to be larger.] – double check with TE vendors
* For FH TCs, introduce a new PRS RMC with large BW and repetitions.
	+ A CR revision is needed to include the new PRS RMC for 15 kHz (FR1) and 120 kHz (FR2) – Qualcomm to revise a submitted CR

**Discussion in AH2**:

* TE(R&S) input on the earlier tentative agreement from AH1 [For PRS BW for FH TCs, consider the BW in test configuration as UE BW and allow cell BW to be larger.]:
	+ Different BWs for cell and UE have never been used
	+ There will be confusion between OCNG and UE BW, even if we go that way
	+ Challenge for TE: interpret OCNG (and other RMCs) as the UE BW
	+ Two steps could be considered:
		- Step 1: in the configuration, separately cell BW and UE channel BW are mentioned
		- Step 2: resolve the OCNG issue
	+ FFS: UE total BW should match a cell BWP (added off-line)
	+ Recommendation: consider the above input in the work on TCs

# Performance requirements for PRS/SRS BW aggregation

### **Issue 6-1: Group delay margin for positioning measurement by aggregating PRS resources**

**Agreement:**

* Group delay margin values defined in Tables 10.1.23.2-5/5a and 10.1.23.2-6/6a are reused to define group delay margin values for RSTD measurements performed by aggregating PRS resources on multiple PFLs.
* Group delay margin values defined in Tables 10.1.25.2-5 and 10.1.25.2-6 are reused to define group delay margin values for UE Rx-Tx measurements performed by aggregating resources on multiple PFLs

### **Issue 6-2: Frequency drift margin for positioning measurement by aggregating PRS resources**

**Agreement:**

* RAN4 to define frequency drift margin for RSTD measurement on the PRS resources from the reference and target TRPs belonging to the same PFL group or different PFL groups by reusing the values of Y from the existing specification.

### **Issue 6-3: PRS configuration for positioning TCs for PRS aggregation**

**Agreement:**

* + PRS BW per PFL based on the existing PRS RMC with largest BW is considered for the accuracy TCs for positioning measurements based on the PRS aggregation.