

3GPP TSG RAN Meeting #98e

RP-223095

Electronic Meeting, December 12 – 16, 2022

# Discussion on Rel-18 Positioning enhancement SI recommendation and WID scope

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# Overall considerations on Rel-18 positioning WI scope

- **Potential agendas in WI**
  - Sidelink positioning
  - RAT-dependent integrity
  - Carrier phase positioning
  - Low Power and High Accuracy Positioning (LPHAP)
  - RedCap positioning
  - PRS/SRS aggregation
- **Observation: if all the recommendations for all agendas are captured into WID scope, it will lead to excessive workload.**
- **Proposal: WID scoping for each agenda should not only consider WG's recommendation but also take overall workload into account.**

# Sidelink positioning

- **Recommendations from RAN1 study**
  - RTT type solution(s) using SL, SL-AoA and SL-TDOA and the associated measurements should be recommend as sidelink positioning solutions.
  - A new sidelink reference signal (SL-PRS), resource allocation schemes, resource pools, the unicast, groupcast and broadcast should be recommended for sidelink positioning.
  - The bandwidth requirement for sidelink positioning are recommended based on the evaluation in licensed and ITS spectrum.
- **Recommendations from RAN2 study**
  - Procedures/signaling for supporting SL positioning in in-coverage, partial coverage and out-of-coverage scenarios.
  - Combination of Uu- and PC5-based positioning and PC5-only-based positioning .
  - Protocol and procedures for SL positioning between UEs.
  - Protocol and procedures for SL positioning between UE and LMF.

# Sidelink positioning

- **Proposal: Unlicensed spectrum is not considered in Rel-18 sidelink positioning WID scope.**
- **Proposal:** The following should be included in the WID scope:
  - Specify sidelink positioning solutions to support absolute positioning, relative positioning and ranging, considering in-coverage, out-of-coverage and partial-coverage scenarios: [RAN1, RAN2]
    - Specify positioning methods (e.g., RTT-type solution(s) using SL, SL-AoA, SL-TDOA) including SL positioning measurements considering PC5 only and combination of Uu- and PC5-based positioning. [RAN1, RAN2]
    - Specify a new reference signal (i.e., SL-PRS) design. [RAN1]
    - Specify signaling , measurements, procedures (e.g., power control, congestion control, measurement report) for supporting SL positioning on dedicated resource pool and shared resource pool with resource allocation Scheme 1 and Scheme 2 [RAN1, RAN2]
      - Notes: Backward compatibility should be taken into consideration when shared resource pool is configured.
  - Specify signaling and procedures to support sidelink positioning considering PC5 only and combination of Uu- and PC5-based positioning. [RAN2]
    - Specify SLPP protocol for SL positioning procedures between UEs.
    - Specify signaling and procedures for SL positioning between UE and LMF.

# RAT-dependent integrity

- **Recommendations from study**
  - For UE-based positioning integrity mode, potential specification impacts related to errors in assistance data (e.g., related to inter-TRP synchronization error and TRP locations) include at least the enhancements to assistance data from the LMF to the UE (e.g., inclusion of parameters related to the error sources).
  - Signaling design of both UE-based and LMF-based integrity can be supported.
- **Proposal: RAN1 work for RAT-dependent integrity should not be triggered unless RAN2 identifies specific issues to be resolved by RAN1.**
- **Proposal:** The following should be included in the WID scope:
  - Specify signaling and procedures to support UE-based and LMF-based positioning integrity determination of RAT-dependent positioning techniques. [RAN2, RAN3]

- **Recommendations from RAN1 study**
  - For UL and DL+UL positioning for UEs in RRC\_INACTIVE state, the enhancements on SRS for positioning in order to avoid frequent RRC connection for SRS (re)configuration is recommended for normative work.
  - Extending DRX cycle beyond 10.24s was studied and found beneficial towards meeting the battery life requirement for LPHAP and is recommended for normative work on Rel-18 positioning enhancements from physical layer's perspective.
  - From physical layer's perspective, DL PRS measurement for UEs in RRC\_IDLE state is recommended for the normative work.
- **Recommendations from RAN2 study**
  - Enhancements on SRS configuration, including validity area of SRS configuration, SRS configuration request and pre-configuration of multiple SRS configurations .
  - Alignment between DRX and PRS.
  - DL positioning in RRC\_IDLE.
  - Skipping paging reception in RRC\_INACTIVE if feasible and beneficial from RAN1 perspective.
- **Observation: Extending DRX cycle beyond 10.24s on Rel-18 positioning enhancements recommended by RAN1 is mainly RAN2's work. In addition, considering there is an on-going work for eDRX in RedCap WI, coordination with RedCap WI may be needed.**
- **Observation: The feasibility and benefits of DL positioning skipping paging reception in RRC\_INACTIVE were not confirmed by RAN1 during the SI phase.**

# LPHAP

- **Proposal:** Skipping paging reception in RRC\_INACTIVE can be dropped due to lack of RAN1 confirmation in SI phase and would increase RAN1 load further if needs to be studied in RAN1.
- **Proposal:** The following should be included in the WID scope:
  - Specify signaling and procedures for reducing the power consumption of positioning in RRC\_INACTIVE/IDLE to support LPHAP requirement (use case 6 as defined TS 22.104), including: [RAN2, RAN1, RAN3]
    - SRS configuration and transmission enhancement in RRC\_INACTIVE to avoid frequent RRC connection for SRS (re)configuration.
    - Alignment between DRX and PRS.
    - Enhanced eDRX in RRC\_INACTIVE beyond 10.24s on positioning enhancement.
      - Note: coordination with RedCap WI may be needed.
    - DL positioning in RRC\_IDLE.

# RedCap positioning

- **Recommendations from RAN1 study**
  - From RAN1's perspective, for positioning of RedCap UEs, support of PRS frequency hopping and SRS frequency hopping is recommended for normative work.
    - During the normative work, the complexity of the corresponding capabilities for RedCap UEs should be addressed for the introduction of appropriate capabilities for RedCap UEs.
- **Potential spec impact from RAN1 study**
  - Maximum tolerable phase error, timing gap, and timing error between hops.
    - Considerations for IIoT, commercial, Public Safety and V2X scenarios, and UE capabilities.
  - Details on the Tx or Rx hopping pattern(s), including frequency overlapping between hops, if supported.
- **Potential down-scoping candidate recommendations: [PRS frequency hopping].**
- **Proposal:** The following should be included in the WID scope:
  - Support SRS frequency hopping and [PRS frequency hopping] to address positioning accuracy limitations for RedCap UEs, including: [RAN1, RAN2, RAN4]
    - Addressing the complexity of the corresponding capabilities for the introduction of appropriate capabilities for RedCap UEs.
    - Maximum tolerable phase error, timing gap, and timing error between hops.
    - Details on the hopping pattern(s), including frequency overlapping between hops, if supported.
    - Related signaling and procedures.

# PRS/SRS aggregation

- **Observations from RF study**
  - PRS/SRS bandwidth aggregation for intra-band contiguous carriers is studied by RAN4. Based on the study, PRS/SRS bandwidth aggregation for intra-band contiguous carriers is concluded as feasible for single chain Tx/Rx architectures at both the UE and gNB.
  - The assumption for a single-chain Tx architecture is that PRS/SRS resources to be aggregated are transmitted from a single Tx antenna.
- **Observations from RRM study**
  - PRS/SRS bandwidth aggregation across PFLs for positioning measurements is concluded as feasible from RRM perspective.
- **Proposal : PRS/SRS aggregation can be dropped from Rel-18 positioning WI if overall workload is unacceptable.**
- **Proposal :** The following should be included in the WID scope (if needed):
  - Specify measurements, signalling, and procedures for supporting PRS/SRS bandwidth aggregation for intra-band contiguous carriers.[RAN1, RAN2, RAN3]
  - Define requirements for supporting PRS/SRS bandwidth aggregation for intra-band contiguous carriers.[RAN4]

THANK YOU.

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