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3GPP TSG RAN Meeting #101
Bangalore, India, September 11-15, 2023
Agenda item: 8A.2.12.4 Positioning enhancements

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Views on Rel-19 Positioning Enhancement

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Rel-18 positioning summary

- The objective of Rel-18 WI on expanded and improved NR positioning is to:
  - Specify solutions to introduce sidelink ranging/positioning
  - Improve positioning accuracy by DL and UL carrier phase positioning
  - Enable low power high accuracy positioning use-case 6 defined in TS22.104
  - Introduce integrity for RAT-dependent positioning methods
  - Introduce support of positioning for RedCap UEs

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Rel-19 positioning enhancement

SL positioning enhancement

Motivation

- For Rel-19 SL positioning , it is natural to extend the Rel-18 work to meet different requirements on accuracy, latency and other criterions in various use cases and scenarios.
- Although SL PRS transmission in FR2 is not precluded in Rel-18, no FR2 specific aspects will be specified according to the latest WID. The corresponding normative work is logically anticipated in Rel-19.
- Based on the outcome of SL-U topic in Rel-18, it is well expected to introduce the rich unlicensed spectrum into Rel-19 SL positioning to improve accuracy and adaptability.
- For successfully supported DL and UL carrier phase positioning (CPP) in Rel-18 NR positioning, the application of CPP in Rel-19 SL positioning is reasonable and has been proposed before.

Considerations for Rel-19 [RAN1, RAN2]

- Specify SL PRS and corresponding resource allocation for support of SL positioning in FR2.
- Specify necessary enhancements to beam based operation of SL positioning in FR2.
- Specify necessary channel access, frame structure, resource pool and other aspects for SL positioning on shared spectrum.
- Specify measurement and signaling to support CPP for SL positioning.

Proposal 1: **Support SL positioning enhancement at least for aspects of shared spectrum, FR2, and CPP in Rel-19.**

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Rel-19 positioning enhancement

AI/ML based positioning

Justification:

- AI/ML based position accuracy enhancement has be discussed in Rel-18, and the simulation shown that both direct AI/ML positioning and AI/ML assisted positioning can significantly improve the positioning accuracy even for the high NLoS condition.
- The use of AI/ML models can further enhance the aspects of power and latency for positioning. Additionally, the combination of AI/ML models with phase carrier information can be beneficial in achieving sub-centimeter positioning accuracy in Rel-19.

Objective of Rel-19 AI/ML based positioning enhancement:

- Study enhancements for positioning power consumption.
- Study enhancements for positioning latency reduction e.g., by configuring suitable PRS/SRS resources based on AI/ML models.
- Study further enhancements for positioning accuracy, aiming to achieve sub-centimeter level positioning, e.g., by the combination of AI/ML models and phase carriers.

Proposal 2: **Support AI/ML based positioning enhancement at least for aspects of power, latency, and further accuracy in Rel-19.**

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Rel-19 positioning enhancement

◆ CPP

■ Justification

- CPP mechanism is supported in Rel-18. However, Rel-18 CPP is limited to:
  - Only supports carrier phase measurement for single carrier.

■ Objective of Rel-19 CPP:

- Support enhanced CPP based on the carrier phase measurement on multiple carriers.

Proposal 3: **Support enhanced carrier phase positioning at least for the aspect of carrier phase measurement.**

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Rel-19 positioning enhancement

LPHAP

Justification:

- The WID of Rel-18 expanded and improved NR positioning referred to 'Specify solution for DL PRS measurements for a UE in RRC_IDLE state and reporting of the measurements in RRC_CONNECTED state'. However, there are no any agreements at least from RAN1 aspect, while it was acknowledged that there is RAN1 impact, e.g., UL SRS-Pos transmission in RRC_IDLE state and UE capability.
- Besides, additional consumption can be avoided if the RRC_IDLE state UE reports the measurement of DL PRS in RRC_IDLE state rather than transiting to RRC_CONNECTED state. Also, SRS activation/deactivation for RRC_IDLE UE can be further considered.

***Observation 1*: There are no RAN1 agreements regarding the WID of 'Specify solution for DL PRS measurements for a UE in RRC_IDLE state and reporting of the measurements in RRC_CONNECTED state'.**

Objective of Rel-19 LPHAP:

- Study UL/DL positioning with measurement report in RRC_IDLE state.
- SRS activation/deactivation for RRC_IDLE UE.

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Rel-19 positioning enhancement

***Proposal 4*: Support UL/DL positioning with measurement report in RRC_IDLE state in Rel-19.**

***Proposal 5*: Support SRS activation/deactivation for RRC_IDLE UE in Rel-19.**

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Summary

***Observation 1*: There are no RAN1 agreements regarding the WID of 'Specify solution for DL PRS measurements for a UE in RRC_IDLE state and reporting of the measurements in RRC_CONNECTED state'.**

***Proposal 1:* Support SL positioning enhancement at least for aspects of shared spectrum, FR2, and CPP in Rel-19.**

***Proposal 2:* Support AI/ML based positioning enhancement at least for aspects of power, latency, and further accuracy in Rel-19.**

***Proposal 3:* Support enhanced carrier phase positioning at least for the aspect of carrier phase measurement.**

***Proposal 4*: Support UL/DL positioning with measurement report in RRC_IDLE state in Rel-19.**

***Proposal 5*: Support SRS activation/deactivation for RRC_IDLE UE in Rel-19.**

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