3GPP TSG-RAN WG2 Meeting #123***R2-23xxxxx***

Toulouse, France, 21st – 25th August, 2023

**Agenda item:** 7.2.2

**Source:** CATT

**Title:** [Pre123][402][POS] Summary of AI 7.2.2 sidelink positioning (CATT)

**Document for:**  Discussion

# 1. Introduction

This document summarizes the following contributions submitted for Agenda Item 7.2.2 Sidelink positioning, except the session management which have been discussed and reported in R2-2307660 Report of [ 402] SLPP session handling. The aim of this summary is to consolidate the most common aspects across the contributions. Note that not all proposals are exhaustively included in the discussion below, since the focus is on finding common ground among all the contributions.

R2-2307122 Discussion on higher layer aspects for Sidelink Positioning Huawei, HiSilicon discussion Rel-18 NR\_pos\_enh2

R2-2307123 Discussion on lower layer aspects for Sidelink Positioning Huawei, HiSilicon discussion Rel-18 NR\_pos\_enh2

R2-2307185 UE Positioning using Sidelink in OoC Fraunhofer IIS, Fraunhofer HHI discussion

R2-2307187 Preconfigured Assistance Data for UE Positioning in Hybrid Uu and PC5 scenarios Fraunhofer IIS, Fraunhofer HHI, Ericsson discussion

R2-2307232 Discussion of SLPP / LPP signalling procedures Nokia Netherlands discussion Rel-18

R2-2307241 Discussion of session-less and session-based positioning Nokia Netherlands discussion Rel-18

R2-2307340 SLPP signalling in UE-only sidelink positioning/ranging procedure MediaTek Inc. discussion Rel-18 NR\_pos\_enh2

R2-2307341 Pathological cases of network-based operation for sidelink positioning MediaTek Inc. discussion Rel-18 NR\_pos\_enh2 Revised

R2-2307392 Discussion on sidelink positioning CATT discussion Rel-18 NR\_pos\_enh2

R2-2307426 Discussion on sidelink positioning vivo discussion Rel-18 FS\_NR\_pos\_enh2

R2-2307507 Discussion on SL positioning Xiaomi discussion Rel-18

R2-2307661 Further considerations on sidelink positioning Intel Corporation discussion Rel-18 NR\_pos\_enh2

R2-2307778 SLPP design for session aspects Samsung Electronics Romania discussion

R2-2307823 SL positioning procedures Apple discussion NR\_pos\_enh2

R2-2308052 Further discussion on sidelink positioning OPPO discussion Rel-18 NR\_pos\_enh2

R2-2308125 Discussion on sidelink positioning Spreadtrum Communications discussion Rel-18

R2-2308138 Discussion on sidelink positioning ZTE Corporation discussion Rel-18 NR\_pos\_enh2

R2-2308152 Considerations on sidelink positioning resources Sony discussion Rel-18 FS\_NR\_pos\_enh2

R2-2308276 Discussion on SL Positioning Lenovo discussion Rel-18

R2-2308284 Discussion on sidelink positioning ROBERT BOSCH GmbH discussion Rel-18

R2-2308316 Considerations on Sidelink positioning CMCC discussion Rel-18 NR\_pos\_enh2

R2-2308384 Discussion on sidelink positioning InterDigital, Inc. discussion Rel-18 NR\_pos\_enh2

R2-2308396 Sidelink Positioning Protocol (SLPP) Signaling and Procedures Qualcomm Incorporated discussion

R2-2308416 Pathological cases of network-based operation for sidelink positioning MediaTek Inc., CATT discussion Rel-18 NR\_pos\_enh2 R2-2307341

R2-2308480 Sidelink positioning Ericsson discussion Rel-18

R2-2308557 Discussion of resource allocation aspects Nokia Netherlands discussion

R2-2308595 Discussion on higher layer aspects for sidelink positioning LG Electronics Inc. discussion Rel-18

R2-2308600 Discussion on lower layer aspects for sidelink positioning LG Electronics Inc. discussion Rel-18

R2-2308657 Discussion on priority value for SL-PRS Samsung Electronics Co., Ltd discussion Rel-18 NR\_pos\_enh2

R2-2308800 Further Discussions on Sidelink Positioning & Ranging CEWiT discussion

R2-2308884 Discussion on Anchor UE discovery and selection in sidelink positioning KT Corp. discussion Rel-18 NR\_pos\_enh2

R2-2308908 On the selection of Anchor UEs for Sidelink Positioning Philips International B.V. discussion Rel-18 NR\_pos\_enh2

R2-2308935 On the support of UE-only SL positioning in in-coverage and partial coverage scenarios Philips International B.V. discussion Rel-18 NR\_pos\_enh2 [5] R2-2300937 Correction on SRS for positioning ZTE Corporation CR Rel-16 38.331 16.11.0 3852 - F NR\_pos-Core

# 2. Higher layer aspects for Sidelink Positioning

## 2.1 Procedures

### 2.1.1 Network-based SA2 procedures

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| R2-2307392  CATT | Proposal 6: Capture Figure 2.2-2 as Location Service Support for Network-based Operation in clause 5.2 UE Positioning Operations in TS 38.305.    Figure 2.2-2: Location Service Support for Network-based Operation |
| R2-2307122  Huawei, HiSilicon | Proposal6: RAN2 to discuss the details of SLPP related capability for SL positioning.  Proposal7: UE can send indication about the need of assistance data using SL-MO-LR request sent to AMF.  Proposal8: LMF requesting SLPP capabilities from UE and UE sending SLPP capabilities of itself and the peer UEs within the SLPP session to LMF are needed in SA2 SL-MO-LR procedure.  Proposal9: The list of candidate Located UE is provided in assistance data message.  Proposal10: It is AMF to send the SL-MT-LR to UE instead of LMF.  Proposal11: Application layer ID is carried over SLPP messages between UE and LMF to identify other UEs. |
| R2-2308276  Lenovo | Proposal 11: RAN2 to confirm with SA2 on the supported location services for SL positioning including NI-LR, Immediate Location requests and Deferred location requests which can be re-used as in Uu positioning. FFS the applicability of these location service requests under different coverage scenarios. |

CATT provided the figure of Location Service Support for Network-based Operation. Huawei proposed to discuss some details of SL-MO-LR and SL-MT-LR. Lenovo wanted to confirm with SA2 whether NI-LR, Immediate Location requests and Deferred location requests can be reused for SL positioning.

**Proposal 1: Capture the following Location Service Support for Network-based Operation in stage 2 specification.**



### 2.1.2 UE-only SA2 procedures

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| R2-2307392  CATT | Proposal 5: Capture Figure 2.2-1 as Location Service Support for UE-only Operation in clause 5.2 UE Positioning Operations in TS 38.305. |

CATT provided the figure of Location Service Support for UE-only Operation.

**Proposal 2: FFS Location Service Support for UE-only Operation also can be captured in stage 2 specification.**



## 2.2 Scenario

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| R2-2307392  CATT | Proposal 3: RAN2 to apply terms of “UE-only Operation” and “Network-based Operation” defined in TS 23.586 by SA2 for SLPP procedures.  Proposal 4: RAN2 prioritize the cases below:  UE-only Operation:   * Neither Target UE nor Anchor UE is served by NG-RAN; * Network-based Operation is not supported by the 5GC network.   Network-based Operation:   * Both target UE and anchor UEs are served by NG-RAN and Network-based Operation is supported by the 5GC network. |
| R2-2308416  MediaTek, CATT | Proposal 1: If partial-coverage cases are supported, there are separate SLPP sessions between the in-coverage UE(s) and the LMF, and between the out-of-coverage UE(s) and the in-coverage UE(s).  Proposal 2: If partial-coverage cases are supported, SLPP includes a UE capability for forwarding information for out-of-coverage UEs.  Proposal 3: If partial-coverage cases are supported, an out-of-coverage UE is identified by L2ID in SLPP on the Uu interface (e.g., for purposes of identifying the source/destination of information routed through an in-coverage UE to/from the LMF). FFS if scoping information is needed (e.g., serving cell ID) to disambiguate the L2ID.  Proposal 4: If partial-coverage cases are supported, to deliver a location information request to an out-of-coverage target UE, the LMF sends a Request Location Information message to an in-coverage anchor UE with additional information identifying the destination (i.e., the target UE). Similar mechanisms apply to other SLPP transaction types (at least capability retrieval and assistance data delivery).  Proposal 5: If partial-coverage cases are supported, the LMF requests SL-PRS configurations from the transmitting UE(s), including any transmitting UEs that are out of coverage.  Proposal 6: RAN2 prioritises in-coverage and out-of-coverage sidelink positioning cases in Rel-18. Additional functionality for partial-coverage cases can be revisited if time allows. |
| R2-2307507  Xiaomi | Proposal 1 RAN2 to agree that the principle of SLPP protocol design is to provide enough flexibility to accommodate as much scenario, use case and implementations as possible, but keep the complexity in mind to achieve a well balance between flexibility and complexity.  Proposal 2 SLPP protocol should be able to support all the server UE functionalities either centralized at one UE or distributed at different UEs(at least target and server UE). |
| R2-2308276  Lenovo | Proposal 3: RAN2 to support both LMF-dependent (network-based and network-assisted operation as defined by SA2) (e.g., UEs supporting both LPP and SLPP) for in-coverage scenarios and partial coverage scenarios and LMF-independent (UE-only operation as defined by SA2) (e.g., UEs only supporting SLPP) SL positioning architectures for all coverage scenarios including in-coverage, partial coverage and out-of-coverage.  Proposal 4: Since SA2 has already specified partial coverage scenarios for SL-MO-LR and SL-MT-LR, it is suggested that RAN2 to discuss the procedures and signalling design for partial coverage case in which a target UE is out-of-coverage and at least one of the anchor UEs is in coverage. |
| R2-2308316  CMCC | Proposal 1: RAN2 confirms that the LMF is involved in SL positioning when at least one of the participating UEs in the network coverage if LMF is Ranging/Sidelink Positioning capable.  Proposal 2: If involved, LMF determines the positioning operation mode (e.g., Uu positioning, hybrid PC5+Uu positioning operation, PC5-only positioning operation), anchor UE selection and SL positioning method. |
| R2-2308138  ZTE | Proposal 5: Capture at least the following scenarios in the RAN2 stage-2 specification:   Scenario 1: at least one of a UE has NAS connection(take TS23.273 section 6.20.1, step 10~20 as baseline)   Scenario 1-1: target UE has NAS connection;   Scenario 1-2: target UE does not have NAS connection, while one of the anchor UE has NAS connection;   Scenario 2: none of the UE has NAS connection(take TS23.586 section 6.8, step 4~8 as baseline) |
| R2-2308480  Ericsson | Proposal 3 SL positioning UE server is not involved for in-coverage SL positioning, and no LMF to SL positioning UE server interaction to be supported in Rel-18  Proposal 13 Partial coverage is supported by means of L2 U2N Relay where the LPP protocol terminates/originates at remote UE and LMF. |
| R2-2308384  InterDigital, Inc. | Proposal 6: RAN2 considers how to support the SL positioning in a partial coverage scenario while at least one anchor UE is IC. |

CATT proposed to reuse the term of“UE-only Operation” and “Network-based Operation” defined by SA2. CMCC wanted to confirm that the LMF is involved in SL positioning when at least one of the participating UEs in the network coverage if LMF is Ranging/Sidelink Positioning capable. ZTE proposed to capture the following scenarios in the RAN2 stage-2 specification:

 Scenario 1: at least one of a UE has NAS connection(take TS23.273 section 6.20.1, step 10~20 as baseline)

 Scenario 1-1: target UE has NAS connection;

 Scenario 1-2: target UE does not have NAS connection, while one of the anchor UE has NAS connection;

 Scenario 2: none of the UE has NAS connection(take TS23.586 section 6.8, step 4~8 as baseline)

There were four options on partial coverage support:

Option 1: RAN2 prioritises in-coverage and out-of-coverage sidelink positioning cases in Rel-18. Additional functionality for partial-coverage cases can be revisited if time allows. ( MediaTek, CATT)

Option 2: RAN2 to discuss the procedures and signalling design for partial coverage case. (Lenovo, InterDigital)

Option 3: Partial coverage is supported by means of L2 U2N Relay. (Ericsson)

Option 4: RAN2 need to balance between flexibility and complexity. (Xiaomi)

MediaTek and CATT provided some issues and solution of partial-coverage case.

Rapporteur's Comment:

RAN2 can reuse the term of“UE-only Operation” and “Network-based Operation” defined by SA2. And capture the cases of “UE-only Operation” and “Network-based Operation” in RAN2 stage-2 specification. In TS 23.586, the cases of “UE-only Operation” and “Network-based Operation” are defined as below:

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| UE-only Operation as specified in this clause is applied for the following cases:  - Neither Target UE nor SL Reference UE is served by NG-RAN.  - Network-based Operation is not supported by the 5GC network:  - When Network-based Operation is not supported by the 5GC network, indication on whether the UE is allowed to use UE-only operation to perform Ranging/ SL Positioning is included in the Policy/Parameter provisioned to UE as defined in clause 5.1.1.2, and is provisioned to the UE as defined in clause 5.1.1.1. The Target UE will take it into account to initiate UE-only operation procedure.  - SL-MO-LR request is rejected by the network.  For any other cases, Network-based Operation as specified in clauses 6.20 of TS 23.273 [8] is applied. |

RAN2 can discuss how to capture the cases of “UE-only Operation” and “Network-based Operation” in stage-2 specification: reuse the description in TS 23.586 or define the cases by RAN2.

For partial coverage support, for option 3, L2 remote UE can be treated as in coverage UE since it has NAS connection. Consideration on the progress and time limit, RAN2 can prioritise discuss in-coverage and out-of-coverage sidelink positioning cases, and the additional functionality for partial-coverage cases can be revisited if time allows.

**Proposal 3: RAN2 to apply terms of “UE-only Operation” and “Network-based Operation” defined in TS 23.586 by SA2 for SLPP procedures.**

**Proposal 4: RAN2 to discuss how to capture the cases of “UE-only Operation” and “Network-based Operation” in stage-2 specification. The following definition can be as baseline:**

**Network-based operation:**

* **Case 1: at least one of a UE has NAS connection, and 5GC supports SL positioning.**
  + - **Case 1-1: both target UE and all anchor UEs have NAS connection; (in-coverage)**
    - **Case 1-2: target UE has NAS connection, and at least one of anchor UE does not have NAS connection; (partial-coverage)**
    - **Case 1-3: target UE does not have NAS connection, while at least one of the anchor UEs has NAS connection; (partial-coverage)**

**UE-only operation:**

* **Case 2: none of the UE has NAS connection; (out-of-coverage)**
* **Case 3: target UE has NAS connection, but SL-MO-LR request is rejected by the network. (in-coverage)**

**Proposal 5: RAN2 can prioritise to discuss in-coverage and out-of-coverage sidelink positioning cases. The additional functionality for partial-coverage cases can be revisited if time allows.**

## 2.3 Operation

### 2.3.1 UE-Only SL operation

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| R2-2307232  Nokia | Proposal 1 (see Fig. 1): Both SL positioning UE and LMF shall support the following procedures:   * discovery information indication / transfer based on “Request / Provide Discovery Information” messages * capabilities indication / transfer based on “Request / Provide Capabilities” messages * assistance data indication / transfer based on “Request / Provide Assistance Data” messages * location information indication / transfer based on “Request / Provide Location Information” messages   FFS if discovery information signalling shall be included in assistance data signalling.  FFS if UEs support some indication / transfer procedures selectively or as function of their UE role.    **Fig. 1** – *SLPP / LPP architecture overview (see Proposal 1)*.  Proposal 2: LPP / SLPP signalling supports the storage of UE capabilities at the AMF via the LMF as well as their retrieval from the AMF and delivery to UEs.  Proposal 3: Capabilities indication and transfer signalling from Figs. 1a/b is used as baseline for further discussion.      **Fig. 1a –** *Capabilities* indication.    **Fig. 1b –** *Capabilities* transfer.  Proposal 4: UEs may request or be provided with discovery information including at least the list of (non)-preferred UEs.  Proposal 5: Discovery Information indication and transfer signalling from Figs. 2a/b is used as baseline for further discussion.    **Fig. 2a –** *Discovery Information* indication.    **Fig. 2b –** *Discovery Information* transfer.  Proposal 8: Assistance Data indication and transfer signalling from Figs. 3a/b is used as baseline for further discussion.    **Fig. 3a –** *Assistance Data* indication.    **Fig. 3b –** *Assistance Data* transfer.  Proposal 9: A positioning session is managed based on the distribution of Assistance Data and its updates to session members.  Proposal 10: RAN2 to study mechanisms for session management via Assistance Data updates including error handling. FFS usage of timers.  Proposal 12: Location Information indication and transfer signalling from Figs. 4a/b is used as baseline for further discussion.    **Fig. 4a –** *Location Information* indication.    **Fig. 4b –** *Location Information* transfer.  Proposal 13: Server UE and LMF may exchange location information, e.g., to reuse already existing SL PRS measurements to position a target UE. FFS positioning method parameters and other data. |
| R2-2307340  MediaTek | Proposal 1: From RAN2 perspective, capability exchange between the target UE and the candidate anchor UEs before server UE discovery is not needed.  Proposal 2: The capabilities of the target UE and the candidate anchor UEs are delivered to the server UE.  Proposal 3: The target and anchor UE capabilities can be delivered to the server UE by SLPP signalling as part of the server UE discovery/selection procedures.  Proposal 4: The server UE capabilities can be delivered to the target UE and/or the anchor UEs by SLPP signalling as part of the server UE discovery/selection process.  Proposal 5: Adopt the flow of figure 2 as a baseline procedure for capability exchanges with the server UE.  说明: A screenshot of a computer program  Description automatically generated  Figure 2: Capability exchange during server UE discovery/selection  Proposal 6: Introduce a new SLPP transaction type for server UE selection (steps 6/7 in figure 2).  Proposal 7: Capture the flow of figure 3 as one case of assistance data distribution. The exact messages for steps 1 and 2 can be further discussed.    Figure 3: Assistance data distribution (alternative #1) for downlink-like positioning  Proposal 8: Discuss whether to capture the flow of figure 4 as one case of assistance data distribution. The potential inclusion of an SLPP Request Assistance Data message can be further discussed.    Figure 4: Assistance data distribution (alternative #2) for downlink-like positioning  Proposal 9: Discuss whether to capture the flow of figure 5 as one case of assistance data distribution. The potential inclusion of an SLPP Request Assistance Data message can be further discussed.    Figure 5: Assistance data distribution (alternative #3) for downlink-like positioning  Proposal 10: Capture the flow of figure 6 as a baseline for location information transfer in the downlink case.    Figure 6: Measurement data transfer for downlink-like positioning  Proposal 11: Capture the flow of figure 7 as a baseline for location information transfer in the uplink case.    Figure 7: Measurement data transfer for uplink-like positioning  Proposal 12: SLPP supports delivery of the computed location estimate from the server to the target device in an unsolicited message. FFS if the message is a Provide Location Information or a new transaction type.  Proposal 13: Consider the flow of figure 8 as a baseline operation for downlink-like positioning. FFS whether to capture it in a spec.  说明: A diagram of a server  Description automatically generated  Figure 8: SLPP portions of positioning procedure (downlink-like positioning using alternative #1) |
| R2-2307392  CATT | Proposal 7: Introduce a new clause 6.x Signalling between UEs for SL positioning in TS 38.305.  Proposal 8: Introduce the NR-PC5 interface in TS 38.305 clause 6.1 to support SL positioning.  Proposal 9: Introduce the Sidelink Positioning Protocol (SLPP) in TS 38.305 clause 6.2.  Proposal 12: It is unnecessary to included figure of SLPP PDU Transfer between UEs in TS 38.305.Proposal 15: Introduce a new clause 7.x General SLPP procedures for UE SL Positioning in TS 38.305.  Proposal 16: Capture Figure 2.3-1 and Figure 2.3-2 as SLPP Capability Transfer procedure in TS 38.305.    Figure 2.3‑1: SLPP Capability Transfer procedure    Figure 2.3‑2: SLPP Capability Indication procedure  Proposal 17: Capture Figure 2.3-3 and Figure 2.3-4 as SLPP Assistance Data Transfer procedure in TS 38.305.    Figure 2.3‑3: SLPP Assistance Data Transfer procedure    Figure 2.3-4: SLPP Assistance Data Delivery procedure  Proposal 18: Capture Figure 2.3-5 and Figure 2.3-6 as SLPP Location Information Transfer procedure in TS 38.305.    Figure 2.3‑5: SLPP Location Information Transfer procedure    Figure 2.3‑6: SLPP Location Information Delivery procedure  Proposal 19: Capture Figure 2.3-7 as SLPP Error procedure in TS 38.305.    Figure 2.3-7: SLPP Error handling  Proposal 20: Capture Figure 2.3-8 as SLPP Abort procedure in TS 38.305.    Figure 2.3-8: SLPP Abort |
| R2-2307426  vivo | Proposal 4: Introduce a SLPP procedure of request/provide discovered anchor UE. Send a LS to SA2 to Inform the conclusion. |
| R2-2307823  Apple | Proposal 3: to support the equivalent of “UE-based positioning for SL”.  Proposal 4: use the figure(s) in this contribution to further discuss the SL positioning procedure with the intention of producing a stage-2 CR. |
| R2-2308276  Lenovo | Proposal 13: RAN2 to support the signalling design for the agreed RAN1 SL Positioning measurements including measurement configuration using SLPP Request Location Information and measurement reporting using SLPP Provide Location Information. |
| R2-2308316  CMCC | Proposal 7: If server is involved, sidelink positioning capability and assistant data can be exchanged between server and target/anchor UEs.  Proposal 8: If server is not involved, sidelink positioning capability and assistant data can be exchanged between target UE and anchor UEs. |
| R2-2308800  CEWiT | Proposal 11: Generic endpoint concept shall be used for SLPP procedures as depicted in figure 1. |
| R2-2308480  Ericsson | 1. Take the procedure in Figure 3 as baseline SLPP procedures. |
| R2-2308396  Qualcomm Incorporated | Proposal 16: An SLPP *Provide Capabilities* message should provide information on the ability of the device to support different position methods defined for SLPP (e.g., SL-RTT, SL-TDOA, etc.), different aspects of a particular position method (e.g. different types of measurements or assistance data) and features specific to certain UE roles (e.g. ability to operate as a server or anchor UE, etc.).  Proposal 17: The SLPP *Request Assistance Data* message should allow an SLPP-capable endpoint to request positioning assistance data (e.g., SL-PRS configuration information and resources) from a server (e.g., server UE or LMF). The SLPP *Provide Assistance Data* message should allow a server (e.g., server UE or LMF) to provide positioning assistance data (e.g., SL-PRS configuration information and resources) to participant UEs in a session.  Proposal 18: The SLPP *Request/Provide Location Information* message should allow an SLPP-capable endpoint to request/provide location measurements or location estimate from participant UEs in a session. |
| R2-2308284  Robert Bosch GmbH | Proposal 6: RAN2 to confirm the signaling flow for UE based sidelink positioning for out of coverage with server UE (optional, and possibly co-located with target UE) as captured in Figures 1. Figure 1 UE sidelink positioning for out of coverage scenario with server UE (Optional) |

Nokia and vivo proposed to introduce “Request / Provide Discovery Information” message.

For SLPP procedures, there were two options on how to capture the SLPP procedures in stage 2 specification:

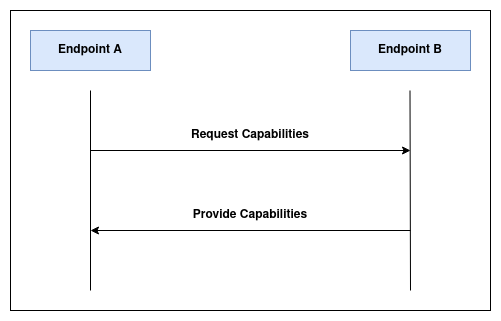
* Option 1: capture the entire procedure of SL positioning in the stage 2 specification; (Nokia, MediaTek, Apple, Ericsson, Robert Bosch GmbH)
* Option 2: capture the separate procedures of each SLPP transfer as well as legacy Uu positioning. (Nokia, MediaTek, CATT, Qualcomm, CEWiT)

According to the Clause 6.8 Procedures of Ranging/Sidelink Positioning control in TS 23.586, Procedures for Ranging/Sidelink Positioning control (UE-only operation) are specified by SA2 as below:



Figure 6.8.1-1 Procedures for Ranging/Sidelink Positioning control (UE-only operation)

**Proposal 6: RAN2 to discuss capture the separate procedures of each SLPP transfer in stage-2 protocol as well as legacy Uu positioning, e.g.**



### 2.3.2 Network-based operation

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| R2-2307392  CATT | Proposal 14: Capture Figure 2.2-5 as SLPP PDU Transfer between LMF and UE in TS 38.305 clause 6.4.  Figure 2.2-5: SLPP PDU transfer between LMF and UE (network- and UE-triggered cases) |
| R2-2308316  CMCC | Proposal 3: RAN2 to discuss information to be reported by UE or RAN to assist the LMF for SL positioning related determinations:   * The capability for anchor UE and server UE roles; * Supported positioning method; * Measurement report for the TRPs measured by the target UE; * UE ID list for UEs discovered by the target UE; * LOS/NLOS indication; * Indication about Located or not |

CATT proposed to capture the procedure of SLPP PDU Transfer between LMF and UE in stage 2 specification. CMCC suggested to discuss the parameters reported from UE or RAN to LMF.

### 2.3.3 Session-less operation

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| R2-2307661  Intel | Proposal 4: Postpone the discussion on support of the sessionless operation until the session-based operation is matured and the associated security aspects are clear. |
| R2-2307778  Samsung | Proposal 5. RAN2 agree that there is no need to restrict the used cast type for session-less SLPP.  Proposal 6. RAN2 agree that session-less operation can work with security.  Proposal 7. RAN2 agree that both the session-less and session-based SLPP operation are necessary to be described in the SLPP protocol specification. |
| R2-2308800  CEWiT | Proposal 7: Session-less approach can be used in cases where always ON positioning function requests are required. |
| R2-2308396  Qualcomm Incorporated | Proposal 11: Session-less operation is established without mutual exchange of SLPP session establishment signaling via transmission of the SLPP Provide Assistance Data message.  Proposal 12: SLPP session-less operation can be denoted by a specific allocation of SLPP Session ID values or by omission of the SLPP Session ID. |

Intel suggested to postpone the discussion on support of the sessionless operation until the session-based operation is matured and the associated security aspects are clear. Samsung considered session-less operation can work with security. And both the session-less and session-based SLPP operation are necessary to be described in the SLPP protocol specification. CEWiT considered that session-less approach can be used in cases where always ON positioning function requests are required. Qualcomm considered that session-less operation is established without mutual exchange of SLPP session establishment signaling via transmission of the SLPP Provide Assistance Data message.

Rapporteur's Comment:

The security aspect of session-less operation is still not clear, RAN2 can prioritise discuss session-based operation.

**Proposal 7: RAN2 to postpone the discussion on support of the session-less operation until the session-based operation is matured and the associated security aspects are clear.**

## 2.4 Discovery and selection

### 2.4.1 Discovery related including information and procedures

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| R2-2307122  Huawei, HiSilicon | Proposal3: No other information than UE role needs to be carried within the discovery message/DCR message. And reply to SA2 that for Located UE or Server UE selection can happen after discovery. |
| R2-2307232  Nokia | Proposal 6: SLPP metafield in discovery messages allows specifying minimum required parameters / capabilities. FFS if pre-defined capability “profiles” can be used for compact representation.  Proposal 7: In Mode B discovery, no Discovery Response is sent if minimum required parameters / capabilities / profile specified in the Discovery Request are not supported. |
| R2-2307392  CATT | Proposal 24: Besides roles of UE, the following parameters can be included in the metadata in the discovery message:  1) Supported sidelink positioning methods  2) In coverage or not  3) Location  4) PLMN  5) Stationary or movable |
| R2-2307426  vivo | Proposal 5: confirm that RAN2 is responsible to define the structure of metafield of discovery message, i.e., the structure of metafield is defined in SLPP specification.  Proposal 6: RAN2 to define the individual metafield structures separately for Announcement message, Solicitaion message and Response message.  Proposal 7: To support model B discovery of target UE and reference UE for ranging, the SLPP metafield in Solicitation message should includes UE role information and UE ID.  Proposal 8: To support model A/B discovery of anchor UE for absolute positioning:   * For model A, the SLPP metafield in Annoucement message should include UE role information, assistant data (e.g., SL PRS transmission config), location info (FFS) * For model B, the SLPP metafield in Solicitation message should include UE role information (anchor UE), filter conditions, e.g., requirement of supported method/measurement, mobility-related information.   Proposal 9: To support model A/B discovery of positioning server UE, the SLPP metafield in Annoucement message and Solicitation message should include UE role information.  Proposal 10: For model B discovery, it is FFS on SLPP metafield in Response message, e.g., SL positioning capability of the UE. |
| R2-2307507  Xiaomi | Proposal 12 Support indicating multiple UE roles in the metafield of discovery message.  Proposal 13 To indicate the located UE role in metafield, at least the UE role “anchor UE” as well as the indication “whether the location of the anchor UE is known or able to be known” are needed.  Proposal 14 Requested UE role(s) can be indicated in the metafield of solicitation/Direct Communication Request message.  Proposal 15 Which role(s) of the requested UE role(s) are supported can be indicated in the metafield of Response/Direct Communication Response message.  Proposal 16 For discovery mode A, RAN2 to agree that at least the following information can also be included in the metafield of announcement message: supported SL positioning method(s), mobility state(stationary or not), in coverage or not, location accuracy, PLMN.  Proposal 17 For discovery mode B, RAN2 to agree that at least the following information can also be included in the metafield of solicitation/Direct Communication Request message: Requested SL positioning methods, Low Mobility required, In coverage required, LOS path required, Location accuracy requirement, PLMN.  Proposal 18 For discovery mode B, RAN2 to agree that at least the following information can also be included in the metafield of Response/Direct Communication Response message: Supported SL positioning methods. |
| R2-2307661  Intel | Proposal 5: In addition to the UE role, RAN2 to discuss which of the following information shall be included as part of the discovery messages (for both model A and B):  a) SL positioning capabilities, including supported positioning methods by the anchor UE(s)  b) Ability to compute location information based on SL-PRS measurements  c) Ability to perform absolute vs relative positioning/ranging calculation |
| R2-2308052  OPPO | Proposal 3: RAN2 to agree that the anchor UE role indication should be included in the discovery model A announcement message, and the required UE role, i.e. demand of the anchor UEs should be included in the discovery model B solicitation message transmitted by the target UE.  Proposal 4: RAN2 to agree that the in-/out-of-coverage indication is provided in the discovery model A announcement message or the discovery model B solicitation response message transmitted by the candidate anchor UE.  Proposal 5: RAN2 to agree that the indication of the availability of the location of the anchor UE is provided in the discovery model A announcement message or the discovery model B solicitation response message transmitted by the candidate anchor UE.  Proposal 6: RAN2 to agree that the RSRP and the LOS/NOLS related information are not needed to be included in the discovery message for anchor UE selection.  Proposal 7: RAN2 to agree that the PLMN info should not be included in the Announcement message transmitted by the candidate anchor UE in discovery model A and the Solicitation msg transmitted by the target UE in the discovery model B.  Proposal 8: RAN2 to agree that the UE also indicates whether or not it is capable of serving as the SL Positioning Server UE in the discovery model A announcement msg or the discovery model B response msg for the anchor UE discovery procedure.  Proposal 9: RAN2 to agree that the candidate anchor UE AND the candidate SL positioning server UE indicates the supported positioning method and/or the supported positioning QoS requirement(s) as the SL positioning server UE in the discovery model A announcement msg.  Proposal 10: RAN2 to agree that the required positioning QoS requirement or the indication of the required SL positioning method(s) for selection of the SL positioning server UE should be considered to be embed in the discovery model B solicitation message transmitted by the target UE for the purpose of making selection of the qualified SL Positioning server UE. |
| R2-2308125  Spreadtrum | Proposal 3: In addition to UE roles, location should be included in the metadata discovery message. |
| R2-2308276  Lenovo | Proposal 5: RAN2 to further discuss the inclusion of the Located UE in the SLPP metafield .  Proposal 6: RAN2 to confirm indication of SLPP support as part of the SLPP metadata field, in addition to the UE roles. |
| R2-2308316  CMCC | Proposal 4: RAN2 to confirm that indication about knowledge of location could be carried by the discovery message.  Proposal 5: RAN2 to confirm that general UE capability (e.g., support of SLPP, supported positioning methods) could be carried by the discovery message. |
| R2-2302982  KT Corp. | Proposal 1. In order to guarantee and maintain the good positioning accuracy, we would like to suggest that discovery and selection procedures must be a part of the positioning layer in RAN2 scope.  Proposal 2. Anchor UE discovery operation should be triggered by the target UE or anchor UE or SL positioning server UE or LMF.  Proposal 3. Anchor UE discovery and selection operations can be a one procedure.  Proposal 7. We would like to propose to trigger the discovery operation by configuring a minimum number of anchor UEs for each positioning method  Proposal 8. We would like to propose to discuss a discovery and selection operation including triggering point that can cover the scenarios above.  Proposal 9. And we also suggest to discuss how to define UE group IDs. |
| R2-2308480  Ericsson | Proposal 4 Anchor/Reference UE indicate whether it is PRU capable or not in the SL positioning discovery message.  Proposal 5 Target UE may include QoS requirement for SL positioning in discovery message, and anchor UE may include supported QoS for SL positioning in discovery message.  Proposal 6 Sidelink positioning parameters can be indicated in both discovery modes. |
| R2-2308396  Qualcomm Incorporated | Proposal 29: Discovery is included in the sidelink positioning procedure for all PC5 sidelink positioning scenarios (in-coverage and out-of-coverage). |
| R2-2308908  Philips International B.V. | Proposal 4: During SL Positioning Discovery, the Anchor UE needs to be able to indicate that it is in coverage and has access to an LMF that supports Ranging/Sidelink positioning or not.  Proposal 2: To aid down-selection of Anchor UEs, auxiliary information in SL Discovery messages should include information on location status, such as location accuracy, location refresh time, an (average) location validity time.  Proposal 3: RAN2 should as part of the SLPP/RSPP protocol provide a capability exchange mechanism to enable an Anchor UE to provide more details related to the stability and accuracy of the location of the Anchor UE, and also enable the ability to notify or express to the Target UE or LMF or SL positioning server UE about a change to this capability. |
| R2-2308384  InterDigital, Inc. | Proposal 1: Study discovery model(s) (e.g., anchor UE initiated, target UE initiated) to discover anchor UEs and contents of discovery messages for each model. |

Vivo, Xiaomi, OPPO and InterDigital proposed to define the individual metafield structures separately for different discovery messages (Announcement message, Solicitaion message and Response message).

For the content of metafield, the following parameters were mentioned:

1) Supported sidelink positioning methods; (CATT,vivo, Xiaomi, Intel, OPPO, CMCC)

2) In coverage or not; (CATT, Xiaomi, Philips)

3) Location; (CATT,vivo, Xiaomi, Spreadtrum, CMCC)

4) PLMN; (CATT，Xiaomi)

5) Stationary or movable; (CATT,vivo, Xiaomi)

6) Assistant data (e.g., SL PRS transmission config); (vivo)

7) Requested UE role(s); (Xiaomi)

8) Location accuracy; (Xiaomi，Philips)

9) Filter condition: e.g. Requested SL positioning methods, Low Mobility required, In coverage required, LOS path required, Location accuracy requirement, PLMN, required QoS requirement; (Nokia, vivo, Xiaomi, OPPO, Ericsson)

10) Ability to compute location information based on SL-PRS measurements; (Intel)

11) Ability to perform absolute vs relative positioning/ranging calculation; (Intel)

12) Supported positioning QoS requirement(s); (OPPO, Ericsson)

13) SLPP support; (Lenovo, CMCC)

14) PRU capable or not; (Ericsson)

**Proposal 8: RAN2 to discuss whether define the individual metafield structures separately for different discovery messages (Announcement message, Solicitaion message and Response message).**

**Proposal 9: RAN2 to discuss following parameters can be included in the metadata in the discovery message:**

**1) Supported sidelink positioning methods; (CATT,vivo, Xiaomi, Intel, OPPO, CMCC)**

**2) In coverage or not; (CATT, Xiaomi, Philips)**

**3) Location; (CATT,vivo, Xiaomi, Spreadtrum, CMCC)**

**4) PLMN; (CATT，Xiaomi)**

**5) Stationary or movable; (CATT,vivo, Xiaomi)**

**6) Location accuracy; (Xiaomi，Philips)**

**7) Filter condition: e.g. Requested SL positioning methods, Low Mobility required, In coverage required, LOS path required, Location accuracy requirement, PLMN, required QoS requirement; (Nokia, vivo, Xiaomi, OPPO, Ericsson)**

**8) Supported positioning QoS requirement(s); (OPPO, Ericsson)**

**9) SLPP support; (Lenovo, CMCC)**

### 2.4.2 Anchor UE selection

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| R2-2307507  Xiaomi | Proposal 11 RAN2 to agree that if the UE who performs discovery procedure is different from the UE who performs anchor UE selection, at least the following information regarding the candidate anchor UE needs to be exchanged by SLPP：  1. UE roles  2. Supported positioning method  3. In coverage or not  4. RSRP  5. LOS/NLOS  6. Location  7. PLMN |
| R2-2307185  Fraunhofer | Proposal 4: In scenarios where the server UE is not the same physical device as the target UE, RAN2 shall discuss how we provide measurement on RSRP, LOS/NLOS to the server UE to enable the server UE to decide on anchor nodes for a target UE.  Proposal 5: In scenarios where the target UE is the same as the server UE, RAN2 shall discuss how the target UE obtains RSRP, LOS/NLOS information for selecting the anchor UEs.  Proposal 4: Server UE interacts with anchor UEs to add anchor UEs for a given target UE.  Proposal 6: Measurement performed by the target UE using preconfigured assistance data (in sessionless operation) may be used by the server UE to select anchor UEs for a target UE.  Proposal 7: UEs are configured with monitoring resources to refine the selection of UEs that are anchor nodes for a given UE. The monitoring resources may have lower periodicity or bandwidth from the resources used for ranging. |
| R2-2307661  Intel | Proposal 6: For initial anchor UE selection after discovery, RAN2 is proposed to confirm that LMF/server UE based approach is used, where LMF/server UE obtains information about candidate anchor UEs selected from the target UE.  Proposal 7: From RAN2 perspective, target UE may include information about capabilities of the candidate UEs in the location request to the LMF/server UE.  Proposal 8: RAN2 supports the procedure to allows the UE to report the need for anchor UE reselection to the LMF.  Proposal 9: For anchor UE reselection during an ongoing SL positioning procedure, at least SL link quality based (SL-PRSRP) shall be considered.  Proposal 10: The link quality (SL-RSRP) and any other criteria for anchor UE reselection can be captured in the stage 2 specification and there is no need to capture the details of how the LMF/UE determine the anchor UE (i.e. in stage 3). |
| R2-2308125  Spreadtrum | Proposal 2: The RSRP, LOS/NLOS and location should be considered in anchor UE selection, in addition to SA2 listed factors. |
| R2-2308276  Lenovo | Proposal 7: RAN2 is recommended to support procedures related to anchor UE(s) including triggering, (re)selection, and configuration when performing sidelink positioning procedures. RAN2 to further discuss how to capture the Anchor UE selection parameter list in the Stage 2 or Stage 3 specification. |
| R2-2308316  CMCC | Proposal 6: Anchor UE selection bases on information from discovery procedure and the positioning capability exchange procedure. |
| R2-2308884  KT Corp. | Proposal 4. Only the anchor UE selection operation is repeatedly performed under specific conditions and/or events after one discovery operation.  Proposal 5. Anchor UE(s) that receive the discovery message can measure the SINR and/or RSRP of the discovery message. And anchor UE(s) can exclude themselves form the anchor UE candidate if it is lower than the certain threshold.  Proposal 6. If supported positioning method (target UE) is included in the discovery message, it is possible to prevent unnecessary candidate anchor UE from being discovered. |
| R2-2308595  LG Electronics | Proposal 6. Anchor UE selection is supported by following information:  1. UE roles  2. Supported positioning method  3. In coverage or not  4. RSRP  5. LOS/NLOS  6. Location  6.5 Ability to provide location information  6.6 Accuracy/integrity of location information  6.7 Velocity and direction information  6.8 Zone ID  7. PLMN  8. Type of UE  9. RAN2 to ask RAN1 on additional AS parameters for anchor UE selection.  Proposal 7. Anchor UE selection is supported by following procedures:  1. Discovery procedure - including UE roles, Supported positioning method, Type of UE  2. SLPP capability exchange procedure - including In coverage or not, RSRP, LOS/NLOS, Location, PLMN |
| R2-2308284  Robert Bosch GmbH | Proposal 7: Based on LMF/server UE assumption, RAN2 to down select between the following options for anchor UE selection after discovery:  - Option 1: The LMF/server UE based approach: where the LMF/server UE is sending the candidate Anchors list for the Target to select from. The exact selection criteria is (as in RAN2#122 agreement above) is also sent by LMF/server UE based.  - Option 2: The LMF/server UE assisted approach: where the LMF/server UE may provide selection criteria (based on the 7 criteria in RAN2#122 agreement above) to the target UE for it to make its final selection accordingly.  - Option 3: autonomous selection approach: the target is autonomously selecting the Anchors where the selection criteria is listed (as in RAN2#122 agreement above) [No need for specifying support for server UE/LMF]  Proposal 9: RAN2 to discuss how to handle possible case when anchor UE(s) is(are) served by other PLMN as the target UE. |
| R2-2308384  InterDigital, Inc. | Proposal 2: At least positioning method, coverage and RSRP should be specified as selection criteria for anchor UE selection.  Proposal 3: Specify which entity (e.g., target UE or LMF (or server UE)) performs anchor UE selection.  Proposal 4: For OoC, a target UE discovers the server UE and server UE provides a list of anchor UEs.  Proposal 5: Study the impact of target or anchor UE status change (IC-PC, OoC-PC, IC-OoC) in the middle of the SL positioning procedure. |
| R2-2308138  ZTE Corporation | Proposal 1: For anchor UE selection, support target UE to consider RSRP, LOS/NLOS, UE capability and known location as RAN2 criteria. For server UE selection, support target UE to consider RSRP, LOS/NLOS and UE capability as RAN2 criteria. FFS on QoS.  Proposal 2: The selection criteria of UE roles, PLMN, in coverage or not, known location or not can be contained in discovery message(both Mode A announcement and Mode B Solicitation and Response), and selection criteria of UE capability can be contained in SLPP capability transfer message. FFS on QoS.  Proposal 3: Reply LS to SA2 that anchor/server UE selection takes place when finishing discovery message and SLPP capability transfer message. |
| R2-2308908  Philips International B.V. | Proposal 1: RAN2 should define criteria or allow the network to configure criteria by which the Anchor UE can determine if its location is sufficiently stable and/or sufficiently accurate to announce itself as “Located UE”.  Proposal 6: A Target UE should report all Anchor UEs that it was able to discover in such manner that the LMF is able to derive which Anchor UEs the Target UE was not able to discover.  Proposal 7: The wording “In coverage or not” should be updated to “Served by LMF supporting ranging/SL positioning or not”. This wording also covers the case that the UE is not in coverage.  Proposal 8: During SL Positioning Discovery, the Anchor UE needs to be able to indicate whether it is in coverage and has access to an LMF that supports ranging/SL positioning or not.  Proposal 9: The meaning of LOS/NLOS as criterium for Anchor UE selection needs to be clarified and requires further discussion. |

Xiaomi considered the UE performs anchor UE selection may be different from the UE performs discovery. And for this case, information of the candidate anchor UE needs to be exchanged by SLPP.

Fraunhofer, Intel and InterDigital supported LMF/server UE performs anchor UE selection. ZTE proposed target UE performs anchor UE selection. Robert Bosch GmbH suggested RAN2 doing down selection from LMF/server UE based approach, LMF/server UE assisted approach and autonomous selection approach.

CMCC, LG and ZTE proposed that anchor UE selection bases on information from discovery procedure and the positioning capability exchange procedure, i.e., anchor UE selection takes place after finishing discovery message and SLPP capability transfer message.

Intel supported anchor UE reselection.

**Proposal 10: RAN2 to discuss who performs anchor UE selection: LMF/server UE or target UE.**

**Proposal 11: Anchor UE selection bases on information from discovery procedure and the positioning capability exchange procedure.**

### 2.4.3 Server UE selection

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| R2-2307122  Huawei, HiSilicon | Proposal2: Reply to SA2 that for Server UE selection, RAN2 consider the following information of UE:   * UE role to be server UE; * supported positioning method; * capability for calculation; * assistant data distribution; * anchor UE selection; * SL-PRS configuration coordination. |
| R2-2307185  Fraunhofer | Proposal 1: A session shall be created at a server UE, a server UE shall be selected by the target UE from the following options:   * Option 1: The server UE (functionality) resides at the target UE itself. * Option 2: The server UE (functionality) resides at a different UE (standalone or coexisting with anchor UE role).   Proposal 2: A target UE requests a server UE from a shortlist of server UE candidates to create a session or takes the server UE role itself.  Proposal 3: A target UE shall indicate parameters enabling the server UE fulfilling the parameters to respond, and the target UE shall select a server UE from the responding server UEs according to certain criteria. |
| R2-2307392  CATT | Proposal 23: The following criteria can be considered for SL positioning server UE selection:  1) Supported roles of UE (SL positioning server UE)  2) Supported sidelink positioning methods  3) RSRP  4) Stationary or movable |
| R2-2308125  Spreadtrum | Proposal 1: Server UE can be either co-located with a target UE/anchor UE, or operated by a separate UE. |
| R2-2308276  Lenovo | Proposal 10: RAN2 to support that the server UE functionality are considered as part of the Anchor UE or Target-UE, LMF may decide Target-UE or Anchor UE executes the result calculation when server UE is co-located with a Target-UE or Anchor UE. |
| R2-2308284  Robert Bosch GmbH | Proposal 8: RAN2 to confirm that all the functionalities of server UE are located in the same UE, which can be the Targe UE, Anchor UE, or a third-party UE. |

Fraunhofer, Spreadtrum, Lenovo and Robert Bosch GmbH proposed that the server UE can be either co-located with a target UE/anchor UE, or operated by a separate UE. Robert Bosch GmbH considered the functionalities of server UE are located in the same UE.

For SL positioning server UE selection, the following parameters were mentioned:

1) Supported roles of UE (SL positioning server UE); (Huawei, CATT)

2) Supported sidelink positioning methods; (Huawei, CATT)

3) RSRP; (CATT)

4) Stationary or movable; (CATT)

5) Capability for calculation; (Huawei)

6) Assistant data distribution; (Huawei)

7) Anchor UE selection; (Huawei)

8) SL-PRS configuration coordination. (Huawei)

Rapporteur's Comment:

Capability for calculation, assistant data distribution, anchor UE selection and SL-PRS configuration coordination are the functionalities of SL positioning server UE. If an UE announces to support roles of SL positioning server UE, it supports these functionalities.

**Proposal 12: The SL positioning server UE can be either co-located in a target UE/anchor UE, or operated by a separate UE.**

**Proposal 13: The following parameters can be considered for SL positioning server UE selection:**

**1) Supported roles of UE (SL positioning server UE)**

**2) Supported sidelink positioning methods**

**3) RSRP**

**4) Stationary or movable**

## 2.5 Reply LS to SA2

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| R2-2307392  CATT | Proposal 26: Reply SA2 that RAN2 had agreed to introduce SL Positioning Assistance Data in SLPP procedure which is used for both UE based and network based Ranging/SL Positioning. It is not exposed to SA2, and there is no impact on SA2 procedure. |
| R2-2308276  Lenovo | Proposal 12: RAN2 to confirm RAN1’s SA2 reply on the relative velocity QoS parameter. |
| R2-2308138  ZTE Corporation | Proposal 4: reply SA2 with a LS indicating that, for UE based Ranging/SL Positioning, when absolute positioning and SL-TDOA is used, the UE should be provided with RTD between anchor UEs as assistance information. For other cases in Rel-18, no assistance information is needed. |
| R2-2308053  OPPO | Proposal 1 RAN2 to consider the draft reply LS attached in Annex 1 as baseline.  Proposal 2 RAN2 to consider the draft reply LS attached in Annex 2 as baseline. |

There are two LS from SA2: R2-2307054 and R2-2307056.

For R2-2307056 (LS on assistance information provided to UE), CATT proposed to reply SA2 that RAN2 had agreed to introduce SL Positioning Assistance Data in SLPP procedure which is used for both UE based and network based Ranging/SL Positioning. It is not exposed to SA2, and there is no impact on SA2 procedure. ZTE proposed to reply SA2 that for UE based Ranging/SL Positioning, when absolute positioning and SL-TDOA is used, the UE should be provided with RTD between anchor UEs as assistance information. For other cases in Rel-18, no assistance information is needed.

For R2-2307054 (Reply LS to LS to SA2 on Sidelink positioning procedure), Lenovo proposed RAN2 to confirm RAN1’s SA2 reply on the relative velocity QoS parameter.

**Proposal 14: For R2-2307054 (Reply LS to LS to SA2 on Sidelink positioning procedure), RAN2 to confirm RAN1’s SA2 reply on the relative velocity QoS parameter.**

**Proposal 15: For R2-2307056 (LS on assistance information provided to UE), reply SA2 that RAN2 had introduced SL Positioning Assistance Data in SLPP procedure which is used for both UE-based and network-based Ranging/SL Positioning. It is not exposed to SA2, and there is no impact on SA2 procedure.**

## 2.6 Specification design

### 2.6.1 Architecture

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| R2-2307392  CATT | Proposal 1: UE B is a NR-only UE without LTE-Uu in the Sidelink Positioning Architecture.  Proposal 2: NR PC5 connection between UE B and UE C can be kept in the Sidelink Positioning Architecture. |
| R2-2308276  Lenovo | Proposal 1: RAN2 to confirm the NR PC5 link between UE-C and UE-B as part of the NR-only partial coverage scenario in the SL Positioning baseline architecture.  Proposal 2: RAN2 to remove the “FFS LTE-Uu” link between UE-B and ng-eNB in the SL positioning baseline architecture. |
| R2-2308480  Ericsson | Proposal 1 RAN2 to consider modification of Figure 2 on top of the baseline architecture figure. |

CATT, Lenovo and Ericsson proposed to include NR-only UE in the architecture. CATT and Lenovo proposed to keep the NR PC5 connection between UE B and UE C.

**Proposal 16: Capture the Sidelink Positioning architecture figure in stage 2 specification.**

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### 2.6.2 SLPP specification design

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| R2-2308276  Lenovo | Proposal 9: RAN2 to confirm that the Destination L2-IDs are generated in Ranging/SL Positioning Layer. |
| R2-2308595  LG Electronics | Proposal 8. Unified structure is preferred in both cases, SLPP between UEs (i.e. UE-only sidelink positioning) and SLPP between UE and LMF (i.e. LMF-involved sidelink positioning). |
| R2-2308396  Qualcomm Incorporated | Proposal 14: SLPP should indicate the transaction (communication) mode to be used for each SLPP message, i.e. whether broadcast mode, groupcast mode or unicast mode is to be used (e.g., in a common SLPP message header). At least the following common transaction modes shall be supported:  • Unicast transaction  • Group Transaction with Group Replies  • Group Transaction with Unicast Replies  • Broadcast Transaction.  NOTE: Not all SLPP message types may be allowed for all transaction modes.  Proposal 30: An SLPP message contains a common header (including e.g., session ID, UE IDs, transaction IDs, etc.) and a message body realizing the individual SLPP transaction types (capability transfer, assistance data transfer, location information transfer, etc.).  Proposal 31: RAN2 adopts as an agreement the working assumption, “The SLPP ASN.1 design should allow "selective ASN.1 compilation", i.e. The overall SLPP functionality is divided into "groups", where each group is defined as a separate ASN.1 module.” |
| R2-2308138  ZTE Corporation | Proposal 6: For SLPP specification design, support joint ASN.1 signaling of broadcast/groupcast and unicast, all the need code(need M, need R, need S, need N) can be applied, need M should be clarified that only applied to unicast mode.  Proposal 7: ToAddModList/ToReleaseList should not be introduced in the joint signaling.  Proposal 8: The term ‘sender’ and ‘receiver’ can be used to indicate signaling direction, and signalings should distinguish UE/LMF when it is necessary. |
| R2-2308052  OPPO | Proposal 12: RAN2 to agree that at least following three positioning method related IEs should be included in the SLPP RequestLocationInformation msgs:   * SL-AOA-RequestLocationInformation * SL-TDOA-RequestLocationInformation * SL-RTT-RequestLocationInformation   Proposal 13: RAN2 to agree at least following IEs should be included in the SLPP ProvideLocationInformation msg at least:   * commonIEsProvideLocationInformation (including the position estimate result or the ranging result) * SL-Multi-RTT-ProvideLocationInformation * SL-TDOA-ProvideLocationInformation * SL-AOA-ProvideLocationInformation |
| R2-2307507  Xiaomi | Proposal 8 The instigator of an SLPP session will always instigate the first SLPP transaction, but subsequent transactions may be instigated by any endpoint.  Proposal 9 SLPP transactions are indicated at the SLPP protocol level with a transaction ID(same as LPP).  Proposal 10 The explicit indication of end of transaction is supported for SLPP (same as LPP). |

Lenovo suggested that the Destination L2-IDs are generated in Ranging/SL Positioning Layer.

LG proposed that unified structure is preferred in both SLPP between UEs and SLPP between UE and LMF.

Qualcomm suggested that an SLPP message contains a common header (including e.g., session ID, UE IDs, transaction IDs, etc.) and a message body realizing the individual SLPP transaction types (capability transfer, assistance data transfer, location information transfer, etc.). Furthermore, RAN2 can confirm the working assumption, “The SLPP ASN.1 design should allow "selective ASN.1 compilation", i.e. the overall SLPP functionality is divided into "groups", where each group is defined as a separate ASN.1 module.”. Qualcomm suggested including transaction (communication) mode in SLPP messages to indicate the cast type of SLPP transaction and reply message.

ZTE proposed to support joint ASN.1 signaling of broadcast/groupcast and unicast, all the need code(need M, need R, need S, need N) can be applied, need M should be clarified that only applied to unicast mode. And ToAddModList/ToReleaseList should not be introduced in the joint signaling. Using ‘sender’ and ‘receiver’ to indicate signaling direction, and signalings should distinguish UE/LMF when it is necessary.

OPPO proposed to include positioning method related IEs in the SLPP RequestLocationInformation and ProvideLocationInformation messages. And in the SLPP ProvideLocationInformation message also include commonIEsProvideLocationInformation.

Xiaomi proposed to reuse the LPP transaction mechanism to SLPP.

Below proposals which summarized the ideas from companies can be discussed together the contribution R2-2307662 Further considerations on SLPP specification Intel Corporation discussion Rel-18 NR\_pos\_enh2 which was submitted in AI 7.2.1 Organizational.

**Proposal 17: RAN2 to discuss the contribution R2-2307662 together confirming the following working assumption:**

**The SLPP ASN.1 design should allow "selective ASN.1 compilation", i.e. The overall SLPP functionality is divided into "groups", where each group is defined as a separate ASN.1 module.**

**Proposal 18: RAN2 to discuss the SLPP specification design following the below proposals when R2-2307662 is reviewed:**

1. **Unified structure is preferred in both cases, SLPP between UEs (i.e. UE-only sidelink positioning) and SLPP between UE and LMF (i.e. LMF-involved sidelink positioning).**
2. **An SLPP message contains a common header (including e.g., session ID, UE IDs, transaction IDs, etc.) and a message body realizing the individual SLPP transaction types (capability transfer, assistance data transfer, location information transfer, etc.).**
3. **SLPP indicates the transaction (communication) mode to be used for each SLPP message, i.e. whether broadcast mode, groupcast mode or unicast mode is to be used**
4. **joint ASN.1 signaling of broadcast/groupcast and unicast, all the need code(need M, need R, need S, need N) can be applied, need M should be clarified that only applied to unicast mode.**
5. **ToAddModList/ToReleaseList should not be introduced in the joint signaling.**
6. **The term ‘sender’ and ‘receiver’ can be used to indicate signaling direction, and signalings should distinguish UE/LMF when it is necessary.**
7. **Include positioning method related IEs in the SLPP RequestLocationInformation and ProvideLocationInformation messages. And in the SLPP ProvideLocationInformation message also include commonIEsProvideLocationInformation.**
8. **Reuse the LPP transaction mechanism to SLPP.**

## 2.7 SLPP transport

### 2.7.1 SLPP QoS flow and priority

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| R2-2307122  Huawei, HiSilicon | Proposal1: Based on PC5-U, the SLPP message related configuration can reuse the legacy procedure of sidelink communication, e.g., how priority is configured for each SLPP message. |
| R2-2308284  Robert Bosch GmbH | Proposal 2: Discuss whether mapping between the SL QoS flows (extended for Data, SLPP transport and/or ranging) and SLRBs is similar to SL in Rel-16. FFS: impacts on SDAP sublayer. |

Huawei proposed that the SLPP message related configuration can reuse the legacy procedure of sidelink communication. Robert Bosch GmbH proposed to discuss whether mapping between the SLPP QoS flows and SLRBs is similar to SL in Rel-16.

### 2.7.2 Protocol stack and Segmentation

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| --- | --- |
| R2-2307392  CATT | Proposal 10: Capture Figure 2.2-3 as the protocol stack of SLPP between UEs in TS 38.305 clause 6.x.1, i.e., SLPP layer is over Non-IP/Unstructured layer.    Figure 2.2-3: SLPP Protocol stack between UE and UE  Proposal 11: There isn’t any stage 3 specification impact on PDCP SDU type for SLPP message in TS 38.323.  Proposal 13: Capture Figure 2.2-4 as the protocol stack of SLPP between LMF and UE in TS 38.305 clause 6.4.1.    Figure 2.2-4: SLPP protocol stack between LMF and UE |
| R2-2307426  vivo | Figure 2.2-3: Protocol stack for SLPP between UEs  Proposal 2: Capture the protocol stack of SLPP between UEs in stage 2 specification, i.e., SLPP layer is on top of IP/Non-IP layer. |
| R2-2307507  Xiaomi | Proposal 7 SLPP supports segmentation. |
| R2-2308052  OPPO | Proposal 1: Regarding the protocol stack between UE and UE, RAN2 to take the following figure as baseline to capture in 38305, i.e., SLPP => V2X/ProSe layer => Non-IP/Unstructrued => AS layer. |

CATT, vivo and OPPO provided the SLPP Protocol stack between UEs. CATT also provided the SLPP Protocol stack between UE and LMF. To align with the conclusion of SA2, RAN2 can capture the SLPP Protocol stack proposed by CATT as baseline.

Proposal 19: Capture the following SLPP protocol stack between UEs in stage 2 specification, i.e., SLPP layer is over Non-IP/Unstructured layer.



**Proposal 20: Capture the following SLPP protocol stack between LMF and UE in stage-2 specification based on the agreement made in RAN2#122: SLPP carried over NAS is used between UE and LMF.**



### 2.7.3 SLPP Reliable transport

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| --- | --- |
| R2-2307241  Nokia | Proposal 2: Session-based positioning uses reliable data delivery and error handling based on ACK / NACK feedback and re-transmissions.  Proposal 3: In session-less positioning, error handling and commitment to signalling protocols are only optional except of the interaction with the LMF and server UE.  Proposal 4: When the LMF or the server UE is the signalling source or destination, ACK / NACK feedback and re-transmissions (if applicable) are mandatory. FFS other details of error handling.  Proposal 5: When the LMF or the server UE is the signalling source or destination, the peer UE must   * accept and process “Provide”-type message and * respond to “Request”-type message with an appropriate “Provide”-type message.   FFS mandatory responses for other UE roles.  Proposal 6: At least in session-based positioning, the LMF and OOC UE can exchange at least Assistance Data and Location Information signalling either   * directly (via the serving gNB), or * indirectly via the target UE.   FFS support other SLPP messages. |
| R2-2307507  Xiaomi | Proposal 5 SLPP over PC5-U will support reliable transport for groupcast.  Proposal 6 For SLPP, the sequence number is distinct for different SLPP messages sent in the same [source, destination] pair in the same location session. |
| R2-2307661  Intel | Proposal 1: The same principles of LPP reliable transport (including duplicate detection, acknowledgement and message retransmissions) shall be used for SLPP.  Proposal 2a: The duplicate detection and discard at the RX UE shall rely on use of specific sequence numbers assigned to all SLPP messages.  Proposal 2b: Each SLPP message may carry an ACK request and/or ACK indicator for a specific sequence number and the TX UE may only send the next SLPP message once the previous sequence number has been successfully ACKed.  Proposal 2c: Up to 3 SLPP retransmissions may be sent by the TX UE and in case no ACK is received, the SLPP session may be aborted.  Proposal 3: Reliable transport for groupcast SLPP shall be deprioritized for this release. |
| R2-2308595  LG Electronics | Proposal 4. SLPP over PC5-U/Uu will support reliable transport for groupcast.  Proposal 5. RAN2 to discuss following approaches for groupcast reliable transport:  1. Unicast retransmission on failed UE  2. Selective acknowledgment detection on the transmitting UE  3. Duplication detection on the receiving UE |
| R2-2308396  Qualcomm Incorporated | Proposal 1: SLPP supports at least the LPP reliable transport mechanisms for duplicate detection, acknowledgement and retransmission for unicast, broadcast and groupcast. |

Nokia, Intel, LG and Qualcomm proposed that SLPP supports LPP reliable transport mechanisms(including duplicate detection, acknowledgement and message retransmissions). Xiaomi, LG and Qualcomm supported SLPP reliable transport for groupcast. Intel proposed that reliable transport for groupcast SLPP shall be deprioritized for this release.

RAN2 has agreed SLPP support reliable transport for at least unicast.

|  |
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| Agreements:  SLPP over PC5-U/Uu will support reliable transport for at least unicast. FFS groupcast.  Inform SA2 about our agreements on sidelink positioning, with “take into account” action.  SLPP carried over NAS is used between UE and LMF. FFS on how to manage the session/transaction. |

**Proposal 21: SLPP over PC5-U supports reliable transport for groupcast.**

### 2.7.4 SLPP forwarding

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| R2-2307241  Nokia | Proposal 7: In session-based positioning, at least some session members are configured with SLPP / LPP forwarding information permitting delivery of SLPP / LPP messages via target UE. |
| R2-2308416  MediaTek, CATT | Proposal 4: If partial-coverage cases are supported, to deliver a location information request to an out-of-coverage target UE, the LMF sends a Request Location Information message to an in-coverage anchor UE with additional information identifying the destination (i.e., the target UE). Similar mechanisms apply to other SLPP transaction types (at least capability retrieval and assistance data delivery).  Proposal 5: If partial-coverage cases are supported, the LMF requests SL-PRS configurations from the transmitting UE(s), including any transmitting UEs that are out of coverage. |
| R2-2307426  vivo | Proposal 1: RAN2 to discuss whether and how to support SLPP messages forwarding between LMF and UE that are not served by the LMF:   * Alt 1: SLPP message is transparently forwarded from the UE served by LMF to the UE not served by the LMF.      * Alt 2: UE served by LMF will decode the SLPP message, and then generates another SLPP message and sends it to UE not served by the LMF. In this sense, SLPP is logically divided into two protocols, i.e., SLPPa between LMF and UE served by LMF, SLPPb between UE served by LMF and UE not served by the LMF. |
| R2-2307507  Xiaomi | Proposal 3 SLPP protocol should support forwarding functionality. |

Nokia, MediaTek, CATT,vivo and Xiaomi proposed to support SLPP forwarding functionality. Vivo provided two alternatives for SLPP forwarding functionality.

SLPP forwarding functionality is depending on partial-coverage cases are supported. RAN2 can postpone this discussion based on the conclusion of partial-coverage support.

## 2.8 Others

### 2.8.1 Joint SL and Uu positioning

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| R2-2307187  Fraunhofer | Proposal 3: In hybrid Uu + PC5 scenarios, the LMF provides preconfigured assistance data corresponding to UE anchors using preconfigured assistance data, where each instance of sidelink preconfigured assistance data is applicable in different portion of the network (e.g. V2X zone). |
| R2-2308052  OPPO | Proposal 2: RAN2 to agree that UE-triggering SL positioning criteria e.g., detection of NLOS transmission of the DL-PRS/SRSp, low RSRPP of the received DL-PRS/SRSp, etc, could be configured by the LMF to UE to determine whether or not to trigger SL positioning to calibrate the ongoing Uu positioning session. |
| R2-2308276  Lenovo | Proposal 14: Hybrid Uu and SL positioning can be initiated from standalone Uu positioning or standalone SL positioning when either Uu or SL positioning is not possible or cannot satisfy the positioning requirements/QoS. RAN1 feedback may be required for any measurement and processing impacts from hybrid Uu and SL positioning. |
| R2-2308480  Ericsson | Proposal 8 The target UE shall discover anchor UE/PRU and report to LMF and LMF can setup SLPP positioning session with the discovered PRU directly to send AD or receive SLPP measurement report.  Proposal 9 LMF sets up LPP session with target UE and SLPP sessions with multiple UEs and obtains both Uu and SL measurements for hybrid positioning. LMF maintains the session ID(s) and transaction IDs for the hybrid positioning session.  Proposal 10 LPP should support to request and provide 5G ProSe Capability.  Proposal 11 The PC5 Capability for Ranging/SL positioning should be defined, and LPP should support to request and provide PC5 Capability for Ranging/SL positioning.  Proposal 12 NW provides configuration to UE for the Uu and SL reference signals that are close in time domain and request UE to measure Uu and SL reference signals within a certain time interval. |
| R2-2308138  ZTE Corporation | Proposal 11: Support DL-TDOA-like joint SL & Uu positioning:   For a target UE, Support reporting a RSTD for the timing difference between SL reference node and Uu reference node. |

Companies have shown the different understanding on Joint SL and Uu positioning. LMF will setup LPP session and SLPP session with multiple UEs separately based on the LCS request which is defined by SA2.

**Proposal 21-a: RAN2 to further discuss how to enable hybrid Uu + PC5 based on the procedures which have been defined in SA2.**

### 2.8.2 Groupcast

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| R2-2307392  CATT | Proposal 22: RAN2 to discuss the destination layer-2 ID for SL-PRS transmission via groupcast/broadcast. |
| R2-2307507  Xiaomi | Proposal 5 SLPP over PC5-U will support reliable transport for groupcast. |
| R2-2308800  CEWiT | Proposal 8: For SL capability information exchange, groupcast/broadcast can be supported with security aspects aligned with SA3 inputs.  Proposal 9: For SL assistance information exchange, groupcast/broadcast can be supported for request messages whereas response messages can be unicast.  Proposal 10: For location information exchange, groupcast/broadcast can be supported for the request message whereas response messages can be unicast. |
| R2-2308396  Qualcomm Incorporated | Proposal 3: SLPP supports Location Information exchange over unicast, groupcast and broadcast.  Proposal 15: For groupcast SLPP sessions, SLPP can indicate the set of UEs which should participate in the ranging/positioning session, and the appropriate groupcast destination layer 2 ID UEs should use for session participation. |

### 2.8.3 Multiple target UEs

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| R2-2308480  Ericsson | Proposal 7 For multiple target UEs positioning, the multiple target UE IDs in LCS request should be provided to AMF and LMF. |
| R2-2308396  Qualcomm Incorporated | Proposal 13: SLPP should support UE-based (distributed) sidelink positioning enabling multiple UEs to determine position and range based on exchanged location information. |

### 2.8.4 Group positioning

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| R2-2308396  Qualcomm Incorporated | Proposal 7: RAN2 agrees to convert the following WA to an agreement, “WA: At least part of the group management for group positioning is performed at upper/application layer.” |

### 2.8.5 SL-PRS configuration

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| R2-2307187  Fraunhofer | Proposal 1: Providing sidelink reference signal configuration using preconfigured assistance data (similar to Rel. 17) mechanism shall be supported.  Proposal 2: Elements of preconfigured assistance data may be configured with time validity in addition to area validity. |
| R2-2307426  vivo | Proposal 3: Introduce new SLPP procedures for SL-PRS transmission trigger/deactivation. |
| R2-2307823  Apple | Proposal 2: SLPP Provide Capabilities message can be used to carry (in addition to capabilities) the SL-PRS configuration of the UE. |
| R2-2308052  OPPO | Proposal 11: RAN2 to agree that SL positioning assistance data transfer msg could be used in following scenarios, optionally with the location information of the anchor UEs to be included:   * the SL-PRS transmitter UE sends out its SL-PRS configuration to the location server UE/LMF * the location server UE/LMF transmits the SL-PRS configuration to be monitored to the SL-PRS monitor UEs |
| R2-2308276  Lenovo | Proposal 15: RAN2 to further study the SLPP transmission of the SL positioning configuration depending on the type of configuration node and SL positioning mode (e.g., UE-based or UE-assisted), e.g., gNB, RSU/Anchor-UE, Target-UE by considering at least:   * UE-specific (via dedicated signalling) or common (via broadcast/groupcast signalling, e.g., SIB) SL positioning configurations. * UE assistance information to assist the configuration node, e.g., gNB, LMF, UE in supporting SL positioning procedures. |

# 3. Lower layer aspects for Sidelink Positioning

## 3.1 SL-PRS priority

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| R2-2307123  Huawei, HiSilicon | Proposal1: Define 8 priority levels for SL-PRS priority. Send an LS to RAN1 and SA2  Proposal2: SL-PRS priority is provided by the UE’s own higher layer or the SCI from the peer UE that trigger the SL-PRS transmission. Send an LS to RAN1 and SA2 |
| R2-2307392  CATT | Proposal 25: SL-PRS priority can be derived from Ranging/SL Positioning QoS. |
| R2-2307507  Xiaomi | Proposal 19 RAN2 to discuss the following two options for SL-PRS priority determination:  Option 1: Introduce priority parameter in Ranging/SL Positioning QoS, which wll be mapped to SL-PRS priority.  Option 2: Reuse the priority in RSPP transport QoS, which will be mapped to SL-PRS priority. |
| R2-2308125  Spreadtrum | Proposal 6: SL-PRS priority is determined based on Ranging/SL positioning QoS.  Proposal 7: Send LS to SA2 to ask whether SL-PRS priority is determined only based on Ranging/SL positioning QoS. |
| R2-2308600  LG Electronics | Proposal 1. RAN2 to discuss the SL-PRS priority configuration via higher layers. |
| R2-2308557  Nokia Netherlands | Proposal 6: RAN2 to discuss factors determining the priority value of a SL PRS transmission including QoS of the associated SL positioning request and number of associated UEs. |
| R2-2308284  Robert Bosch GmbH | Proposal 1: Decide whether SL-PRS priority is based only on ranging/SL positioning and inform SA2 about the decision. |
| R2-2308384  InterDigital, Inc. | Proposal 9: RAN2 determines an SL priority value for SL-PRS, given defined SL positioning QoS. |
| R2-2308657  Samsung | Proposal 1: RAN2 is kindly asked to discuss that the Ranging/SL Positioning QoS is related to SL-PRS priority.  Proposal 2: RAN2 is kindly asked to include priority level as SL positioning QoS parameter additionally.  Proposal 3: RAN2 is kindly asked to send LS to SA2 to inform RAN2 decision and ask to include priority as one of QoS parameters for all existing and further positioning method. |

Companies discussed the SL-PRS priority including how to define the value of SL-PRS priority and what the priority is. It seems that majority (CATT, Xiaomi, Spreadtrum, Nokia, InterDigital,Samsung) support at least Ranging/SL Positioning QoS of the associated SL positioning request from higher layer can be the factor determining the priority value of a SL PRS transmission.

What the SL-PRS priority is suggested as 8 priority levels to align with RAN1 agreement. However it seems RAN1 can make the decision of what the data format of priority, since the priority is designed by RAN1. RAN2 will focus on provision of value from higher layer perspective.

**Proposal 22: RAN2 determines an SL-PRS priority value for SL-PRS, at least given defined SL positioning QoS (6/9). UE’s own higher layer provides this value of SL-PRS priority to its physical layer. There is no RAN2 impact when the SL-PRS priority value is provided by the SCI from the peer UE triggering the SL-PRS transmission. RAN2 to send the agreement to RAN1 for confirm and inform SA2.**

## 3.2 SL-PRS resources allocation and request

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| R2-2307123  Huawei, HiSilicon | Resource allocation scheme 1 by DG  Proposal3: When aperiodic SL-PRS transmission is triggered for UE configured with Scheme 1 SL-PRS resource allocation, the UE sends a MAC CE to the gNB for SL-PRS resource request. LS to RAN1 on the detailed content in the MAC CE.  Proposal4: SR can be triggered for SL-PRS resource allocation request MAC CE when there is no UL-SCH resources to accommodate the MAC CE.  Resource allocation scheme 1 by CG  Proposal5: When periodic SL-PRS transmission is triggered for UE configured with Scheme1 SL-PRS resource allocation, the UE sends an RRC message to the gNB for sending the assistance information for CG configuration. LS to RAN1 on the detailed content of the RRC message  Proposal6: The UE sends a CG confirmation MAC CE when the DCI for CG type 2 activation/deactivation is successfully received.  Resource allocation scheme 2  Proposal7a: When there are both sidelink data and SL-PRS pending for transmission, select shared resource pool.  Proposal7b: When there are only SL-PRS pending for transmission while there is no data, prioritize dedicated resource pool  Proposal8: For shared resource pool, all the legacy conditions for resource selection/reselection can be reused.  Proposal9: For SL-PRS transmission on dedicated resource pool, the following legacy conditions are not needed for resource selection/reselection:   * if PSCCH duration(s) and 2nd stage SCI on PSSCH for all transmissions of a MAC PDU of any selected sidelink grant(s) are not in SL DRX Active time as specified in clause 5.28.3 of the destination that has data to be sent * if the selected sidelink grant cannot accommodate a RLC SDU by using the maximum allowed MCS configured by RRC in sl-MaxMCS-PSSCH associated with the selected MCS table and the UE selects not to segment the RLC SDU * if transmission(s) with the selected sidelink grant cannot fulfil the remaining PDB of the data in a logical channel, and the MAC entity selects not to perform transmission(s) corresponding to a single MAC PDU   *Sidelink measurement*  Proposal18: Support CBR measurement on both shared and dedicated resource pool for SL-PRS transmission. |
| R2-2307426  vivo | Proposal 11: RAN2 to discuss issues regarding resource allocation for SL-PRS in terms of   * Issue 1: resource (re-)selection in Scheme 2 * Issue 2: LCP scheme for SL-PRS and sidelink data if SL grant is within shared resource pool * Issue 3: sidelink resource request scheme in Scheme 1 |
| R2-2307507  Xiaomi | Proposal 20 RAN2 to discuss whether resource coordination in SLPP layer is needed for the following parameters:  - SL-PRS bandwidth  - SL-PRS comb size  - number of SL-PRS symbols. |
| R2-2308152  Sony | **Proposal 1: Support providing SL-PRS configuration using RRC signalling.**  **Proposal 2: Introduce support for resource allocation for combined Uu and PC5 based positioning either allocated in two different frequency allocation or interleaved within the same frequency allocation**  **Proposal 3: Consider supporting multiplexing of sidelink positioning reference signal from several UEs within a given set of resources.** |
| R2-2308276  Lenovo | **Proposal 16: RAN2 to further study the impacts of Scheme 1 coordination & signalling of SL PRS resources for one or more UEs participating in a SL positioning session (e.g., one or more anchor UEs and a target-UE) in line with RAN1’s agreement.**  **Proposal 17: RAN2 to further study Scheme 2 coordination of SL PRS resources in line with RAN1’s agreement for one or more UEs participating in a SL positioning session e.g., one or more anchor UEs and a target-UE) including at least:**   * **The use of pre-configured resources in out-of-coverage scenarios.** * **Initiator UE (e.g., target UE) indicates the SL-PRS resource to other UEs involved in SL Positioning (e.g., one or more anchor UEs) over sidelink.** |
| R2-2308557  Nokia, Nokia Shanghai Bell | Observation 1: Resource allocation request and conflict coordination are open issues in Scheme 1 resource allocation.  Proposal 1: RAN2 to support resource allocation requests at the gNB by a given UE on behalf of other UEs involved in SL positioning.  Proposal 2: For Scheme 1 resource allocation, RAN2 to discuss whether the LMF provides directly to the gNB at least some SL PRS characteristics (e.g., bandwidth) required for their resource allocation.  Proposal 3: For Scheme 1 resource allocation, RAN2 to discuss whether LMF may coordinate gNB resource allocation decisions to avoid conflicts among gNBs using the same or overlapping resource pools.  Proposal 4: For Scheme 1 resource allocation, RAN2 to discuss whether UEs may indicate resource allocation conflicts to the gNB and / or LMF.  Proposal 5: RAN2 to discuss whether SL positioning UEs provide channel congestion measurements for SL PRS configuration adaptation. |
| R2-2308384  InterDigital, Inc. | Proposal 7: RAN2 considers how to select a dedicated SL resource pool or a shared SL resource pool.  Proposal 8: RAN2 considers how to request an SL resource (e.g., mode 1) for SL-PRS transmission. |

Companies discussed the SL-PRS resources allocation and how to request in scheme 1 based on the understanding of RAN1 agreement. Companies prefer to discuss the issue on how to request an SL resource (e.g., mode 1) to gNB for SL-PRS transmission.

**Proposal 23-1: RAN2 to discuss UE how to request sidelink resource in Scheme 1 for SL-PRS transmission, including allocation from gNB by CG and DG:**

**- When SL-PRS transmission is triggered for the UE configured with Scheme1 SL-PRS resource allocation by configured grant, the UE sends an RRC message to the gNB for SL-PRS transmission. The UE sends a CG confirmation MAC CE when the DCI for CG type 2 activation/deactivation is successfully received.**

**- When SL-PRS transmission is triggered for the UE configured with Scheme1 SL-PRS resource allocation by dynamic grant, the UE sends a MAC CE to the gNB for SL-PRS resource request. SR can be triggered for SL-PRS resource allocation request MAC CE when there is no UL-SCH resources to accommodate the MAC CE.**

**Send LS to RAN1 to confirm the mechanism and detailed content in the MAC CE if required.**

**Proposal 23-2: RAN2 to discuss how to select a dedicated SL resource pool or a shared SL resource pool and agree the below rules to align with RAN1 agreement:**

* **When there are both sidelink data and SL-PRS pending for transmission, select shared resource pool.**
* **When there are only SL-PRS pending for transmission while there is no data, prioritize dedicated resource pool**
* **For shared resource pool, all the legacy conditions for resource selection/reselection can be reused.**

Channel congestion measurements for SL PRS configuration adaptation has been proposed by companies as well. According to the agreement in RAN1, congestion control mechanisms is reused for Scheme 2 SL-PRS resource allocation. RAN2 may discuss later how to report CBR after there is a clear conclusion in RAN1.

**Agreement**

For Scheme 2 SL-PRS resource allocation, specify congestion control mechanisms using the existing congestion control mechanisms as a starting point.

**Agreement**

In Scheme 2, congestion control can restrict the range of parameters for SL PRS configuration per resource pool by CBR and priority. Consider further the following parameter(s):

* Option 1: SL PRS transmission power
* Option 2: Periodicity of SL PRS
* Option 3: Number of occupied subchannels of SL-PRS (for shared resource pool)
* Option 4: Number of SL PRS resources in a slot
* Option 5: comb-size of a SL PRS resource in a slot
* Option 7: Number of OFDM symbols of a SL PRS resource in a slot
* Option 8: Number of SL PRS (re-)transmissions
* FFS: Other options are not precluded

**Proposal 23-3: RAN2 to support CBR measurement on both shared and dedicated resource pool for SL-PRS transmission, FFS how to report CBR inline with RAN1 progress.**

## 3.3 Location calculation

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| R2-2307122  Huawei, HiSilicon | Proposal5: Server UE/target UE can receive the Anchor UE location information and ARP related location information. |
| R2-2307185  Fraunhofer | Proposal 8: Tx-Rx-TimeDiff reporting shall be relaxed (no need to report RxTxTimeDiff) by enabling the responder to virtually adjust effective transmit time. |
| R2-2308276  Lenovo | **Proposal 8: RAN2 to further discuss the applicable type of SL-PRS and/or the reuse of other SL RS RSRP measurements and associated SL-RAT dependent measurements for which LOS/NLOS indicator is based on, considering RAN1’s agreements related to SL positioning measurements.**  **Proposal 18: RAN2 to consider the supported signalling and procedures depending on which node/entity:**   1. **Performs the SL positioning measurements and associated reporting (e.g., if needed for UE-based like positioning), e.g., RSU/Anchor-UE, Target-UE.** 2. **Performs the SL positioning calculation e.g., gNB, LMF, RSU/Anchor-UE, Target-UE. NOTE: This has a dependency on the SL Positioning architecture as well as positioning modes (e.g., UE-assisted, UE-based).**   **Proposal 19: Support different SL Positioning reporting types including one-shot, triggered and periodic reports*.*** |
| R2-2308284  Robert Bosch GmbH | Proposal 13: RAN2 to consider defining the per panel report (ARP) including the panel used (ARP ID) for measurements, e.g., Tx-Rx time difference and/or angle of arrival,  Proposal 14: RAN2 to consider defining the per panel report (ARP) including possible assistance location information per APR, such as: the panel location in the device and panel orientation.  Proposal 15: RAN2 to consider whether the ARP assistance information report being received by all UEs performing sidelink positioning measurements. |
| R2-2308138  ZTE Corporation | Proposal 10: Server UE can send the calculated location information of the target UE to the target UE. Other cases are not allowed. |
| R2-2308908  Philips International B.V. | Proposal 4: RAN2 should define mechanisms to compensate for the time difference between obtaining/determining the location of an Anchor UE and performing the SL positioning measurements and calculations. |
| R2-2308480  Ericsson | Proposal: Send LS to RAN4 requesting how would the ongoing SL measurements be impacted when the synch source changes and/or coverage status changes. |

Companies discussed the measurement, report and ARP of location for location calculation in SL positioning methods. The signalling reporting for measurement and the signalling of assistance data have been discussed in Clause 2.3 Operation, here we will capture the details information if possible.

**Agreement @RAN1#112bis-e**

Support per ARP based measurement in sidelink positioning. The ARP related information can be reported along with the SL measurement.

FFS on details of ARP related information, including whether TEG ID can be reused for such purpose.

**Agreement@RAN1#113**

For per ARP measurement

* The ARP ID of an ARP used for reception can be reported along with SL positioning measurement in measurement report. The ARP ID is used to uniquely identify an ARP associated with a UE
* FFS: UE can indicate whether different ARPs for Rx and Tx are used for UE Rx-Tx time difference, if the UE optionally reports the Tx time information
* FFS: ARP ID of an ARP used for transmission, and details if supported

**Agreement@RAN1#113**

For provision of assistance information for sidelink positioning, the ARP location information can be provided to LMF or UE.

* FFS: which UEs can receive the location information (note: which may be decided by other WGs)
* FFS: details on the location information, e.g., relative location information
* Note: different ARPs have their own location information

Synch source changes is under discussion in RAN4 so there is no need to send LS to RAN4 so far.

Companies propose that Server UE/target UE can receive the Anchor UE location information and ARP related location information in assistance data for location calculation which is aligned with RAN1 agreement. However as for the measurement per panel report (ARP) which includes the panel used (ARP ID) for, e.g., Tx-Rx time difference and/or angle of arrival, RAN1 still discuss it. So we prefer to wait for further detailed info from RAN1.

**Proposal 24: Server UE/target UE can receive the Anchor UE location information and ARP related location information in assistance data for location calculation.**

## 3.4 MAC issues

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| R2-2307123  Huawei, HiSilicon | *Logical Channel Prioritization*  Proposal10: For destination selection for SL-PRS transmission on both shared and dedicated resource pool, the UE should select the destination with the highest priority in the LCP procedure  Proposal11: For a SL-SCH and SL-PRS transmission on shared resource pool, SL-PRS priority and SL-SCH priority are used for multiplexing the SL-PRS and SL-SCH transmission within the allocated time and frequency resources. LS to RAN1 on the agreement.  *HARQ operations*  Proposal12: The UE stops the SL-PRS transmission on shared resource pool when (a) the maximum number of transmissions by CG is reached; (b) positive ACK is received; (c) negative ACK is not received.  *Collision Handling*  Proposal13: Support collision handling between SL/UU for SL-PRS based on the SL-PRS priority. SL-PRS is prioritized over PUSCH/PUCCH when   * The value of the priority of PUSCH/PUCCH is higher than a threshold, as in legacy * The value of the priority of SL-PRS is lower than a threshold   *DRX*  Proposal14: DRX and dedicated resource pool for PRS transmission should not be configured together.  *MAC PDU generation*  Proposal15: When SL-PRS is transmitted without SL-SCH in the shared resource pool, the Multiplexing and Assembly entity generates MAC PDU containing only padding MAC subPDU for the transmission along with SL-PRS.  *Sidelink UE capability*  Proposal17: Support the transport of SLPP capability in RRC message   * SLPP capability for the UE itself can be transferred from the UE to the gNB via a container in the RRC message UECapabilityInformation * SLPP capability from the peer UE can be transferred from the UE to the gNB via a container in RRC message SidelinkUEInformationNR |
| R2-2308152  Sony | Proposal 4: For congestion control of SL-PRS transmission support the SL-PRS transmission restriction based on UE-type and/or zone/geographical location. |
| R2-2307426  vivo | Proposal 11: RAN2 to discuss issues regarding resource allocation for SL-PRS in terms of   * Issue 1: resource (re-)selection in Scheme 2 * Issue 2: LCP scheme for SL-PRS and sidelink data if SL grant is within shared resource pool * Issue 3: sidelink resource request scheme in Scheme 1 |
| R2-2308600  LG Electronics | Proposal 2. RAN2 to discuss how to support Source/Destination identification for the case that UE does not have data available for transmission.  Proposal 3. RAN2 to discuss whether MAC layer to support multiplexing of LCH, MAC CE and SL-PRS or not.  Proposal 4. RAN2 to discuss resource selection procedure for SL-PRS transmission according to SL-PRS triggering. |
| R2-2308138  ZTE Corporation | Proposal 9: The MAC specification should have another bullet to indicate when a SL-PRS is available, even if there is zero MAC SDUs and zero MAC CEs, the MAC entity can also generate a MAC PDU. |

* One company propose the HARQ issue when ACK is assumed for the SL-PRS and SL-SCH transmission, whether the UE should continue to use the SL grant for retransmission of SL-PRS. However no feedback for SL-PRS is agreed in RAN1 in RAN1#113 as below, so there is no HARQ issue so far.

**Conclusion**

Do not support ACK/NACK feedback for SL-PRS or lower-layer feedback-based retransmissions in Release 18.

* Some companies propose to discuss the issue that LCP scheme for SL-PRS and sidelink data if SL grant is within shared resource pool. According to the RAN1 agreement in #113, there is no such issue since the grant is TDM.

**Agreement**

In shared resource pools,

* With regards to PSCCH and SL-PRS multiplexing, support Alt. B.1. from previous agreement (i.e., Only TDMing is supported)

**Agreement**

In a shared resource pool, SL-PRS, associated PSCCH and PSSCH scheduled by the PSCCH are included in the same slot:

* With regards to PSSCH and SL-PRS multiplexing, only TDMing is supported for the already agreed comb sizes 1, 2, 4
* One company propose that: The MAC specification should have another bullet to indicate when a SL-PRS is available, even if there is zero MAC SDUs and zero MAC CEs, the MAC entity can also generate a MAC PDU.

**Agreement**

In a shared resource pool, SL-PRS, associated PSCCH and PSSCH scheduled by the PSCCH are included in the same slot:

* The PSSCH is used for 2nd SCI and SL-SCH
* Note: the UE may not have data available for transmission. Up to RAN2 how to define the specification support for this case.

Companies may further discuss if there is an issue in MAC specification and how to handle it because it seems a SL communication issue, not SL positioning issue.

* One company discuss the issues of destination selection and how to handle the SL-PRS priority and SL-SCH priority when SL-PRS transmission in share resource pool. This topic is still under discussion in RAN1. RAN2 may further discuss the related issues when there is clear conclusion in RAN1.

**Proposal 25: RAN2 discuss if there is a MAC specification impact for the case that only SL-PRS transmission in a shared resource pool when the UE may not have data available for transmission.**

**Proposal 26: RAN2 further discuss the MAC issues when SL-PRS transmission in share resource pool, including the destination selection and how to handle the SL-PRS priority and SL-SCH priority, in line with RAN1.**

**Proposal 27: RAN2 further discuss the MAC issues of P12, P13, P14, P15, P17 in R2-2307123.**

# 4. Summary

Based on the discussion above on contributions related to sidelink positioning, the following is proposed:

*Higher layer aspects for Sidelink Positioning*

[Network-based SA2 procedures]

**Proposal 1: Capture the following Location Service Support for Network-based Operation in stage 2 specification.**



[UE-only SA2 procedures]

**Proposal 2: FFS Location Service Support for UE-only Operation also can be captured in stage 2 specification.**



[Scenario aspect]

**Proposal 3: RAN2 to apply terms of “UE-only Operation” and “Network-based Operation” defined in TS 23.586 by SA2 for SLPP procedures.**

**Proposal 4: RAN2 to discuss how to capture the cases of “UE-only Operation” and “Network-based Operation” in stage-2 specification. The following definition can be as baseline:**

**Network-based operation:**

* **Case 1: at least one of a UE has NAS connection, and 5GC supports SL positioning.**
  + - **Case 1-1: both target UE and all anchor UEs have NAS connection; (in-coverage)**
    - **Case 1-2: target UE has NAS connection, and at least one of anchor UE does not have NAS connection; (partial-coverage)**
    - **Case 1-3: target UE does not have NAS connection, while at least one of the anchor UEs has NAS connection; (partial-coverage)**

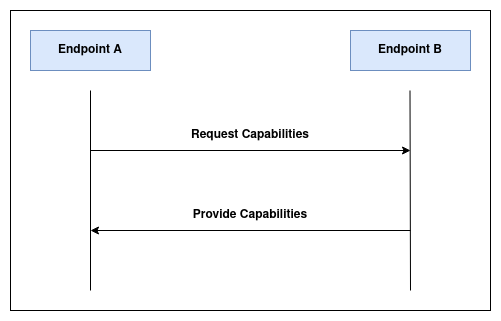
**UE-only operation:**

* **Case 2: none of the UE has NAS connection; (out-of-coverage)**
* **Case 3: target UE has NAS connection, but SL-MO-LR request is rejected by the network. (in-coverage)**

**Proposal 5: RAN2 can prioritise to discuss in-coverage and out-of-coverage sidelink positioning cases. The additional functionality for partial-coverage cases can be revisited if time allows.**

[UE-Only SL operation]

**Proposal 6: RAN2 to discuss capture the separate procedures of each SLPP transfer in stage-2 protocol as well as legacy Uu positioning, e.g.**



[Session-less operation]

**Proposal 7: RAN2 to postpone the discussion on support of the session-less operation until the session-based operation is matured and the associated security aspects are clear.**

[Discovery related including information and procedures]

**Proposal 8: RAN2 to discuss whether define the individual metafield structures separately for different discovery messages (Announcement message, Solicitaion message and Response message).**

**Proposal 9: RAN2 to discuss following parameters can be included in the metadata in the discovery message:**

**1) Supported sidelink positioning methods; (CATT,vivo, Xiaomi, Intel, OPPO, CMCC)**

**2) In coverage or not; (CATT, Xiaomi, Philips)**

**3) Location; (CATT,vivo, Xiaomi, Spreadtrum, CMCC)**

**4) PLMN; (CATT，Xiaomi)**

**5) Stationary or movable; (CATT,vivo, Xiaomi)**

**6) Location accuracy; (Xiaomi，Philips)**

**7) Filter condition: e.g. Requested SL positioning methods, Low Mobility required, In coverage required, LOS path required, Location accuracy requirement, PLMN, required QoS requirement; (Nokia, vivo, Xiaomi, OPPO, Ericsson)**

**8) Supported positioning QoS requirement(s); (OPPO, Ericsson)**

**9) SLPP support; (Lenovo, CMCC)**

[Anchor UE selection]

**Proposal 10: RAN2 to discuss who performs anchor UE selection: LMF/server UE or target UE.**

**Proposal 11: Anchor UE selection bases on information from discovery procedure and the positioning capability exchange procedure.**

[Server UE selection]

**Proposal 12: The SL positioning server UE can be either co-located in a target UE/anchor UE, or operated by a separate UE.**

**Proposal 13: The following parameters can be considered for SL positioning server UE selection:**

**1) Supported roles of UE (SL positioning server UE)**

**2) Supported sidelink positioning methods**

**3) RSRP**

**4) Stationary or movable**

[Reply LS to SA2]

**Proposal 14: For R2-2307054 (Reply LS to LS to SA2 on Sidelink positioning procedure), RAN2 to confirm RAN1’s SA2 reply on the relative velocity QoS parameter.**

**Proposal 15: For R2-2307056 (LS on assistance information provided to UE), reply SA2 that RAN2 had introduced SL Positioning Assistance Data in SLPP procedure which is used for both UE-based and network-based Ranging/SL Positioning. It is not exposed to SA2, and there is no impact on SA2 procedure.**

[Architecture in stage-2 spec]

**Proposal 16: Capture the Sidelink Positioning architecture figure in stage 2 specification.**

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[SLPP specification design]

**Proposal 17: RAN2 to discuss the contribution R2-2307662 together confirming the following working assumption:**

**The SLPP ASN.1 design should allow "selective ASN.1 compilation", i.e. The overall SLPP functionality is divided into "groups", where each group is defined as a separate ASN.1 module.**

**Proposal 18: RAN2 to discuss the SLPP specification design following the below proposals when R2-2307662 is reviewed:**

1. **Unified structure is preferred in both cases, SLPP between UEs (i.e. UE-only sidelink positioning) and SLPP between UE and LMF (i.e. LMF-involved sidelink positioning).**
2. **An SLPP message contains a common header (including e.g., session ID, UE IDs, transaction IDs, etc.) and a message body realizing the individual SLPP transaction types (capability transfer, assistance data transfer, location information transfer, etc.).**
3. **SLPP indicates the transaction (communication) mode to be used for each SLPP message, i.e. whether broadcast mode, groupcast mode or unicast mode is to be used**
4. **joint ASN.1 signaling of broadcast/groupcast and unicast, all the need code(need M, need R, need S, need N) can be applied, need M should be clarified that only applied to unicast mode.**
5. **ToAddModList/ToReleaseList should not be introduced in the joint signaling.**
6. **The term ‘sender’ and ‘receiver’ can be used to indicate signaling direction, and signalings should distinguish UE/LMF when it is necessary.**
7. **Include positioning method related IEs in the SLPP RequestLocationInformation and ProvideLocationInformation messages. And in the SLPP ProvideLocationInformation message also include commonIEsProvideLocationInformation.**
8. **Reuse the LPP transaction mechanism to SLPP.**

[Protocol stack in stage-2 spec]

Proposal 19: Capture the following SLPP protocol stack between UEs in stage-2 specification, i.e., SLPP layer is over Non-IP/Unstructured layer.



**Proposal 20: Capture the following SLPP protocol stack between LMF and UE in stage-2 specification based on the agreement made in RAN2#122: SLPP carried over NAS is used between UE and LMF.**



[SLPP Reliable transport]

**Proposal 21: The same principles of LPP reliable transport (including duplicate detection, acknowledgement and message retransmissions) shall be used for SLPP.**

[Joint SL and Uu positioning]

**Proposal 21-a: RAN2 to further discuss how to enable hybrid Uu + PC5 based on the procedures which have been defined in SA2.**

*Lower layer aspects for Sidelink Positioning*

[SL-PRS priority]

**Proposal 22: RAN2 determines an SL-PRS priority value for SL-PRS, given defined SL positioning QoS (5/8). UE’s own higher layer provides this value of SL-PRS priority to its physical layer. There is no RAN2 impact when the SL-PRS priority value is provided by the SCI from the peer UE triggering the SL-PRS transmission. RAN2 to send the agreement to RAN1 for confirm and inform SA2.**

[SL-PRS resources allocation and request]

**Proposal 23-1: RAN2 to discuss UE how to request sidelink resource in Scheme 1 for SL-PRS transmission, including allocation from gNB by CG and DG:**

**- When SL-PRS transmission is triggered for the UE configured with Scheme1 SL-PRS resource allocation by configured grant, the UE sends an RRC message to the gNB for SL-PRS transmission. The UE sends a CG confirmation MAC CE when the DCI for CG type 2 activation/deactivation is successfully received.**

**- When SL-PRS transmission is triggered for the UE configured with Scheme1 SL-PRS resource allocation by dynamic grant, the UE sends a MAC CE to the gNB for SL-PRS resource request. SR can be triggered for SL-PRS resource allocation request MAC CE when there is no UL-SCH resources to accommodate the MAC CE.**

**Send LS to RAN1 to confirm the mechanism and detailed content in the MAC CE if required.**

**Proposal 23-2: RAN2 to discuss how to select a dedicated SL resource pool or a shared SL resource pool and agree the below rules to align with RAN1 agreement:**

* **When there are both sidelink data and SL-PRS pending for transmission, select shared resource pool.**
* **When there are only SL-PRS pending for transmission while there is no data, prioritize dedicated resource pool**
* **For shared resource pool, all the legacy conditions for resource selection/reselection can be reused.**

**Proposal 23-3: RAN2 to support CBR measurement on both shared and dedicated resource pool for SL-PRS transmission, FFS how to report CBR in line with RAN1 progress.**

[Location calculation]

**Proposal 24: Server UE/target UE can receive the Anchor UE location information and ARP related location information in assistance data for location calculation.**

[MAC issues]

**Proposal 25: RAN2 discuss if there is a MAC specification impact for the case that only SL-PRS transmission in a shared resource pool when the UE may not have data available for transmission.**

**Proposal 26: RAN2 further discuss the MAC issues when SL-PRS transmission in share resource pool, including the destination selection and how to handle the SL-PRS priority and SL-SCH priority, in line with RAN1.**

**Proposal 27: RAN2 further discuss the MAC issues of P12, P13, P14, P15, P17 in R2-2307123.**